UNIVERSIDAD POLITÉCNICA DE MADRID

ESCUELA TÉCNICA SUPERIOR DE INGENIEROS AGRÓNOMOS
DEPARTAMENTO PRODUCCIÓN VEGETAL: FITOTECNIA

Integral development of an Agricultural Training Center to ensure food security in Glory Special Needs Primary School. Kitgum, Uganda.

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JULY 2014

UNIVERSIDAD POLITECNICA DE MADRID

ESCUELA TÉCNICA SUPERIOR DE INGENIEROS AGRÓNOMOS

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This project has been carried out into the Students Movility Program of the Universidad Politécnica de Madrid on its '*V Convocatoria de ayudas para la realizacion del Proyecto Fin de Carrera en Cooperación para el Desarrollo'*. It has been tutored by Carlos Gregorio Hernández-Díaz Ambrona, Professor of the *Departamento de Producción Vegetal: Fitotécnia*, of *ETSI Agrónomos*, and co-tutored by Clement A. Okia, Professor of the Agriculture in Agroforestry Faculty of Makerere University (Uganda).

Daniel del Olmo Rovidarcht

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RESUMEN

El presente proyecto, titulado ***"Integral development of an Agricultural Training Center to ensure food security in Glory Special Needs Primary School. Kitgum, Uganda"*** fue llevado a cabo de Julio de 2011 a Febrero de 2012 en la escuela primaria Glory Special Needs, dedicada a la atención y educación de jóvenes discapacitados, en Kitgum, Uganda.

El proyecto se realizó con la colaboración del grupo de cooperación de la ETSI Agrónomos, AgSystems, la Fundación AmigoSolidarios y la ONG local NUCBACD.

Su objetivo principal fue el desarrollo y puesta en marcha de un centro de capacitación Agrícola para dotar de igualdad de oportunidades a los jóvenes con discapacidad de Kitgum, potenciando y favoreciendo su integración en la comunidad, y garantizar así la seguridad alimentaria de los 137 alumnos internos en la escuela Glory Special Needs.

El trabajo realizado supuso una acción relevante en Kitgum, superando la visión de una economía familiar basada en las actividades agrícolas, para centrarse en la profesionalización de la Agricultura como motor económico de la región.

Este documento presenta una descripción de las principales actividades que se desarrollaron con el fin de alcanzar el objetivo planteado, desde un punto de vista educativo, sostenible e inclusivo.

Para conseguirlo, se plantearon tres lineas de trabajo:

- Programa productivo.
- Programa educativo.
- Programa organizativo.

Palabras clave: *agricultura, integración, capacitación, desarrollo, sostenibilidad*.

ABSTRACT

The present project, entitled **'*Integral development of an Agricultural Training Center to ensure food security in Glory Special Needs Primary School. Kitgum, Uganda*'** was carried out from July 2011 to February 2012 in Glory Special Needs Primary School, dedicated to the care and education of disabled youth, in Kitgum, Uganda.

The project was conducted with the collaboration of ETSI Agronomos cooperation group, AgSystems, AmigoSolidarios Foundation, and the local NGO, NUCBACD.

Its main objective was the development and implementation of an Agricultural Training Center to provide equal opportunities to youth with disabilities in Kitgum, enhancing and promoting their integration into the community, and ensuring food security of the 137 boarding pupils in Glory Special Needs Primary School.

The work was a significant action in Kitgum, exceeding the vision of a household economy based on farming activities, to focus on the professionalization of Agriculture as an engine for the community economy.

This report presents a description of the main activities performed in order to comply with the above mentioned objective, from an educational, sustainable and inclusive point of view.

To achieve this, three work streams were defined:

- Productive program.
- Training program.
- Organizational program.

Key words: *agriculture, integration, training, development, sustainability*.

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ACRONYMS LIST

ACCS Advisory Consortium of Conflict Sensitivity.

ATAAS Agricultural Technology and Agribusiness Advisory System.

CGPA Cumulated Grade Point Average.

CIS Community Information System.

FAO Food and Agriculture Organization.

GDP Gross Domestic Product.

GoU Government of Uganda.

GP Grade Points.

HDI Human Development Index.

HIPC Heavily Indebted Poor Countries.

HIV/AIDS Human Immunodeficiency Virus.

IDP Internally Displaced Person.

IMR Infant Mortality Rate.

KDFA Kitgum District Farmer's Association.

KFH Kitgum Farmers House.

LRA Lord's Revolutionary Army.

MAAIF Ministry of Agriculture, Animal Industry and Fisheries.

MDGs Millenium Development Goals.

MDRI Multilateral Debt Relief Initiative.

NAADS National Agricultural Advisory Services.

NAP National Agricultural Policy.

NARO National Agricultural Research Organization.

NDP National Development Plan.

NGO Non-Governmental Organization.

NUCBACD Northern Uganda Community-Based Action for Children with Disabilities.

PEAP Poverty Eradication Action Plan.

PMA Plan for Modernization of Agriculture.

PPP Public-Private Partnership.

PRDP Peace Recovery and Development Plan.

RDS Rural Development Strategy.

SWOT Strengths-Weakness-Opportunities-Threats.

UBOS Ugandan Bureau of Statistics.

UCA Ugandan Census of Agriculture.

UGsh Ugandan Shillings.

UMIS Uganda's Malaria Indicator Survey.

UN United Nations.

UNDP United Nations Development Program.

UPDF Ugandan People Defense Force.

WFP World food Program.

I. BACKGROUND

1. PROJECT BRIEFFING

The present project has been carried out in Glory Special Needs Primary School, in Alango West village, Alango Parish, Kitgum, Uganda (3° 16' 11"N, 32° 53' 38"E). It was part of the Universidad Politecnica de Madrid' Students Movility Program, in its V Convocatoria para la realizacion del Proyecto Fin de Carrera en Cooperacion para el Desarrollo.

It consists of the integral development of an agricultural training center to enhance the educational ability and ensure the food security of the school.

The project was done in two stages, being the first one the needs identification and alternatives generation phase, and the second one, the design and development of the training center.

Identification phase assumed the performance of a previous study of the municipality to know the reality and the needs to satisfy, direct and potential stakeholders, and to approach local production systems. In order to that, several local authorities, farmer groups and agricultural research centers were met.

Second phase assumed the design and development of the training center, integrating aims and principles of the local counterparty, the NGO Northern Uganda Community-Based Action for Children with Disabilities –NUCBACD-.

The center is oriented to integrate youth with disabilities and war victims in the social life and job market of the municipality. In order to address it, not only necessary facilities were designed, but also the center organization chart and the activities program. The production management will be oriented to feed the 137 boarding pupils in Glory Special Needs Primary School.

Designed and built facilities were, a multipurpose block to impart theoretical lessons, but also for farmer and stakeholder meetings, workshops and daily use as dining room for Glory Special Needs Primary School pupils; a greenhouse, for intensive production of vegetables, and a rainfall harvesting pool, combined with a gravity irrigation system, to collect raining water during wet season and supplying during dry season.

During and after facilities building, and for a period of four months, a pilot program was performed with eight students. Four of them from the elder disabled boarding pupils of the school –deaf- and four non-disabled students, but war victims, from the CARE project of NUCBACD Central headquarter in Gulu, Uganda.

For assists the interaction and integration of both disabled and non-disabled students, they were separated in two mixed groups of four student. The training was complemented by two sign language interpreters.

The center will be managed by NUCBACD, with T. Ayoo as administrative manager and last responsible of the center policy, and P. Obora as agricultural program coordinator, and accountant of the center policy.

2. PROJECT PROMOTERS AND FUNDING

The promoters of the project were NUCBACD, acting as local counterparty, NGO that has been working for the advocacy of disabled Childhood and Youth integration in Northern Uganda since 2005, and AmigoSolidarios Foundation, set up and managed by J. Colomo and that earmark funds for Education to vulnerable communities in Uganda.

The project counted with the technical support and academic backup of AgSystems cooperation group, coordinated by C.G Hernandez and based on E.T.S.I. Agronomos of the Universidad Politecnica de Madrid, and Makerere University's Agriculture and Forestry Department, trough professor C.A. Okia.

The project was funded, in its technical aspect, by ATTITUDE, contributory company of AmigoSolidarios Foundation.

Training stuff, sign language interpreters and leadership team of the training center, as well as all stuff needed by the regular running of Glory Special Needs Primary School will be afforded by NUCBACD.

The exchanging rate Euros- Ugandan shillings at the moment of the project execution was 1€=2,700UGsh.

The total budget earmarked to this project was 51,015,469UGsh (18,894€).

Figure 1. Glory Special Needs Primary School View. *(Source: Own elaboration)*

II. PROJECT IDENTIFICATION

1. HUMAN DEVELOPMENT AND MILLENIUM DEVELOPMENT GOALS

This project was aligned to the UN Millennium Development Goals (MDGs) and close to the strategy of the Uganda's National Development Plan: 2010-2015 (GoU, 2010). This plan defines a medium term strategic direction to reinforce and accelerate the socio-economic transformation of the country in a 30 years period, from a sustainable point of view.

1.1 HUMAN DEVELOPMENT LEVEL

According to the UNDP definition, Human Development is the process by which a society improve the life conditions of its citizens, through an increase of the means which they can cover their basic and complementary needs, and the creation of an environment where their human rights be respected.

The indicator used to measure the human development level of a country is the Human Development Index (HDI), and it is composed by three key parameters: Healthy and long live, Education and Decent Standard of Living.

Uganda's HDI by period 2011-2012 was 0.456, which represents an improvement compared to the previous year, when it was 0.454 and a clear positive evolution since 2000, when the indicator was 0.375.

According to 2012 UNDP country classification by HDI, Uganda ranked 151st position, out of 177 countries. It means that poverty index still high. The 29.8% of the total population live below the poverty line –US$1.20 per day-, with an average income per capita of US$170, and only 43.19% could cover basic needs (World Bank, 2011).

GDP per capita increased from US$504 in 2010, to US$510 in 2011. Last National published data shows that, despite the drop of population living below poverty line, the Poverty gap has increased significantly. The Directorate of Social Protection estimates that 67% of Ugandans are poor or highly vulnerable to poverty.

GINI coefficient, that analyzes the available incomes at national level, was 0.457, being 0 the maximum equality. Regarding to these data, inequality in income distribution has increased, especially at regional level. Table 1 shows the evolution of GINI coefficient in the last 20 years.

Table 1. GINI coefficient in Uganda. National, Urban and rural averages.

Year	1992/93	2002/03	2005/06	2010/11
Uganda	0.365	0.428	0.408	0.457
Rural	0.328	0.363	0.363	0.375
Urban	0.396	0.483	0.432	0.447

(Source: Own elaboration from UBOS data, 2011).

The strong external debt reduction carried out by the Heavily Indebted Poor Countries (HIPC) initiative in 2000, and the Multilateral Debt Relief Initiative (MDRI) in 2005/2006 and 2006/2007, placed debt indicators below the acceptable indebtedness threshold. The position of Uganda's external debt has been reinforced by prudent fiscal policies and reduced public deficits.

New debt -US$3,535 million- was contracted under very high concession conditions and was focused in energetic infrastructures and road funding, and Agricultural sector development. Nowadays external debt is multilateral sourced and has been kept relatively low, positioned on 13.8% of the GDP.

Related to Education, the total adult literacy rate for 2012 was 73.2%, and grows up to 86% in youth. The Primary school net enrollment ratio is 97%. The ratio of girls to boys in primary education is 100%, and 85% in Secondary education. In Tertiary Education this ratio decreased up to 79%.
The 2012 rate of absence from school was 23.8% with a Primary education completion rate of 55%. The rate of students per text book is 14.4.
Enrollment in Secondary education dropped up to 28% (World Bank, 2012), and up to nine per cent in Tertiary education.

In terms of gender, women opportunities are reaching equality levels in Primary education, and keep on going in Secondary and Tertiary education. Have to be highlighted the limited participation of women in job market, which only employs 38% in non-agricultural sector, and in the political life of the country, with a share of women occupying public office of 13%.
Gender violence still a problem of high proportions, as well as inequity in salary reception, with a difference of almost 40% less in women.

The slow development progress of the country, especially in rural communities, has been caused by:

- With 1995 Constitution decentralization of the State was derived, but Uganda still a strongly centralized country, totally dependent on a Central Administration, with clear ethnic prejudices; which development policies favor the central region of the country. This distinction has generated a poverty gap between regions, affecting peripheral districts.

- The strong financial dependency of local governments and the significant administrative weakness they show impede the total coverage of social basic needs.

- Ugandan government is characterized by the lack of a regime that adequately regulates the Civil Service, which leads to high labor instability and discontinuity in public policies arising from the lack of funding.

- The existence of a high degree of institutional corruption and by public employees is perceived as one of the main problems of the country, along with the insecurity and lack of Health services.

- Ugandan economy is poorly diversified, with almost 80% of the work force employed by Agricultural sector.

The country is facing an annual population growth rate of 3.2%, which requires addressing several challenges for those it is not only prepared either structurally or institutionally. Population growth contrasts with the decline of the agricultural sector, which contributes to the appearance of a picture of vulnerability and food insecurity in the medium and long term.

1.2 MILLENIUM DEVELOPMENT GOALS ACHIEVEMENT

Regarding to the state of the UN MDGs, Uganda has been working in a satisfactory way, achieving several of the proposed targets, but this trend has decelerated since 2012.

In 2013, Uganda signed and published an update of the MDGs progress and implications (Ministry of Finance, Planning and Economic Development, 2013) in which explains the situation of the country according to the goals, the strategies followed to achieve the goals and the new challenges to face. Table 2 shows a summary of the progress of the GoU on MDGs targets.

Table 2. Uganda's MDGs progress by 2013.

Goal 1: Eradicate extreme poverty and hunger	
Target 1.A: Halve the proportion of people whose income is less than one dollar per day.	Achieved
Target 1.B: Achieve full and productive employment and decent work for all, including women and youth.	No target
Target 1.C: Halve the proportion of people who suffer from hunger.	On track
Goal 2: Achieve universal primary education	
Target 2.A: Ensure that children everywhere, boys and girls alike, will be able to complete a full course of primary schooling.	Slow
Goal 3: Promote gender equality and empower women	
Target 3.A: Eliminate gender disparity in primary and secondary education by 2005, and in all levels of education by 2015.	On track
Goal 4: Reducechildmortality	
Target 4.A: Reduce by two thirds the under five mortality rates.	On track
Goal 5: Improvematernal health.	
Target 5.A: Reduce by three quarters the maternal mortality ratio.	Stagnant
Target 5.B: Achieve universal access to reproductive health.	Slow
Goal 6: Combat HIV/AIDS, malaria and other diseases	
Target 6.A: Have halted by 2015 and begun to reverse the spread of HIV/AIDS.	Reversal
Target 6.B: Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it.	On track
Target 6.C: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases.	On track
Goal 7: Ensure environmental sustainability	
Target 7.A: Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources.	Slow
Target 7.B: Reduce biodiversity loss, achieving by 2010, and a significant reduction in the rate loss.	Slow
Target 7.C: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation.	On track
Target 7.D: By 2020, to have achieved a significant improvement in the lives of at least 10 million slum dwellers.	No target
Goal 8: Develop a global partnership for development	
Target 8.B: Address the special needs of the least developed countries.	Slow
Target 8.D: Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term.	Achieved
Target 8.E: In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries.	On track
Target 8.F: In cooperation with the private sector, make available the benefits of new technologies, especially information and communications.	On track

(Source: Ministry of Finance, Planning and Economic Development, 2013).

According with the Ministry of Finance, Planning and Economic Development, and briefly summarized, the status of each the eight goals is as follows:

Goal 1: Eradicate extreme poverty and hunger.

The national poverty head count declined from 56.4% in 1992-1993 to 24.5% in 2009-2010, and the trend still decreasing. If it continues in that way, Uganda is on course to reach the national target to reduce poverty to 10% by 2017.

Due to this progress, the general perception of who is poor has also changed to reflect a demand for opportunities rather than absolute deprivation.

Inequality remains a concern. The poorest quintile accounts for only 6.2% of national consumption. The poverty gap ratio has declined faster than the headcount index and is indicative of rising average consumption among Uganda's poor, meaning that individuals below the poverty line are less poor today than in the past.

Goal 2: Achieve universal primary education.

Universal Primary Education dramatically increased primary school enrolment and continues to reduce inequalities in access to education relating to gender, income and location. It has also increased the probability that children start primary school on time.

Dropout rates and grade repetition remain high, and it is unlikely that all Ugandan children will be able to complete the full course of primary schooling by 2015.

Goal 3: Promote gender equality and empower women.

The Government has made progress in promoting gender equality and empowering women, most notably in achieving gender parity in primary education. Girls have closed the gap with boys in enrolment. In 2010, for the first time, there were more Ugandan girls enrolled in primary schools than there were boys.

Greater gender equality in the education system has been slow to translate into the economic and social spheres. Gender inequalities are evident in patterns of time use. On average women work seven hours a week less than men in economic activities, but significantly more in homecare activities.

Women are at a major disadvantage in the labor market. Men's median wages are around double that of women's regardless of the type of work undertaken. The most important obstacles affecting women in the labor market are structural in nature, and that transformation of the Ugandan economy – particularly

shifting labor out of agriculture into non-farm activities – will help to significantly reduce gender-based inequalities.

The rapid growth of non-agricultural employment over recent years is benefiting both, women and men. Although women account for only around one third of non-agricultural paid employees, this proportion is gradually increasing.

Goal 4: Reduce child mortality.

Uganda has reduced child mortality markedly during the past four years. But will require continued efforts to achieve MGDs target.

Goal 5: Improve maternal health.

Uganda has made progress in five of the six indicators for maternal health, but is unlikely to meet the targeted reduction in maternal mortality by 2015.
Between 2006 and 2011 there was a large increase in the proportion of births assisted by a trained health worker, from 42% to 58%.

This marked improvement over the past trend has occurred across all regions of the country including hard-to-reach rural areas. There has also been an improvement in access to care after childbirth, with 33% of women receiving postnatal care within two days.

Goal 6: Combat HIV/AIDS, malaria and other diseases.

Progress has been registered in reducing the burden of all three diseases, particularly malaria and tuberculosis. Improved access to treatment has reduced the number of deaths associated with HIV/AIDS, but the prevalence rate among the 15 to 24 age group has increased. This may partly be because improved treatment has indirectly contributed to a rise in the number of new infections by ensuring greater longevity for those living with HIV.

Malaria remains Uganda's largest public health concern and a leading cause of poverty and low productivity. In 2009, Uganda's Malaria Indicator Survey (UMIS) found the prevalence of malaria among children under five to be 42.4%; but significant progress has been made to roll back the disease.

The country has also made substantial progress in the fight against tuberculosis. The prevalence of tuberculosis fell from 410 per 100,000 in 2001 to 183 in 2011.

Goal 7: Ensure environmental sustainability.

Focus on targets in three areas: biodiversity loss, safe water and basic sanitation, GoU recognizes that the country's natural resource base will be a crucial factor in the socioeconomic transformation process.

There is concerted effort on the part by GoU and stakeholders to progressively integrate the principles of sustainable development in National policies and programs. There has also been progress in access to safe water, basic sanitation, and improvement in the lives of slum dwellers.

Uganda however still struggles with loss in biodiversity. This has been driven by land clearing for agriculture and wood extraction for energy. Reduced forest cover seriously threatens biodiversity and potentially lucrative economic activities such as ecotourism.

On safe water and basic sanitation, Uganda has made progress on both indicators. The proportion of the Ugandan population with access to improved drinking water sources has increased significantly from 52% in 2001-2002 to 70% in 2011.

There has been a steady increase in the share of the rural population using improved sanitation facilities, from 69.6% in 2006 to 72.8% in 2011, but progress in urban areas has stagnated.

If current trends continue, Uganda is on course to meet both the safe-water and sanitation MDGs by 2015 in rural areas, but meet targets in urban areas is not guaranteed.

Goal 8: Develop a Global Partnership for Development.

This is a large topic with several goals, and especially applies to the international community as a whole, with an emphasis on the actions of developed countries.

Ugandan government is beginning to forge a new relationship with its international development partners focused on the vision of socioeconomic transformation.

1.3 STAKEHOLDERS

The project has been designed in order to have three levels of impact on direct and indirect stakeholders.

- Short term direct stakeholder will be the 137 boarding pupils of Glory Special Needs Primary School, with an improvement and diversification of their diet.

- Mid-term direct stakeholders will be disabled youth of Kitgum, who will have more opportunities to develop a regular life, without suffering the community exclusion and rejection, through a specific and inclusive training that will provide them with professional skills.

- Long term indirect stakeholders will be Kitgum town inhabitants, which will experiment an improvement in their traditional farming systems and yields, a greater variety of products available in their local markets, a boosted local economy, and an inclusive society able to integrate and get along with disabled people.

2. PHYSICAL FRAMEWORK.

The understanding of the background in which the project will be performed is necessary to analyze the problems, needs and concerns of the local population, and appraisal the different alternatives from several perspectives, to get with the best feasible solution.

2.1 LOCATION

The project is located in Glory Special Needs Primary School, NUCBACD headquarter in Kitgum. The school is placed in Alango West village parish, in Kitgum town, Kitgum, Uganda.

Bounded on the North with South Sudan, on the East with Kenya, on the South with Tanzania and Rwanda, and with the Democratic Republic of the Congo on the West, Uganda (Figure 2.) is a landlocked country in Eastern Africa.

Figure 2. Uganda general map, with Kitgum indicated by a red circle. *(Source: http://mapsoftheworld.com)*

With Kampala as capital, the Republic of Uganda comprises 111 districts distributed in four regions, Central, Eastern, Western and Northern, according to the different ethnical groups that traditionally occupied them. Thereby, Baganda people is the main group living in Central region, Banyoro, Banyakole, Batoro, Bakonzo, Bakiga and Banyarwanda are the predominant tribes of Western region; Iteso, Samia, Bagisu and Bagwere are the main groups in Eastern region, and Acholi, Karamajong and Lugbara are the groups living in Northern region. Each district is divided in Counties and Municipalities; and each county is further divided in Sub-counties.

Kitgum-Lamwo district (see Figure 3) is one of the 25 districts forming the Northern region of the country, and along with Amuru, Gulu and Pader-Agago, define the Acholi sub-region.

The sub-region -known as *Acholiland*-has been traditionally marginalized and still one of the remotest and most impoverished areas of Uganda. It comprises a large number of people with a common culture and language who settled in Northern Uganda's central region.

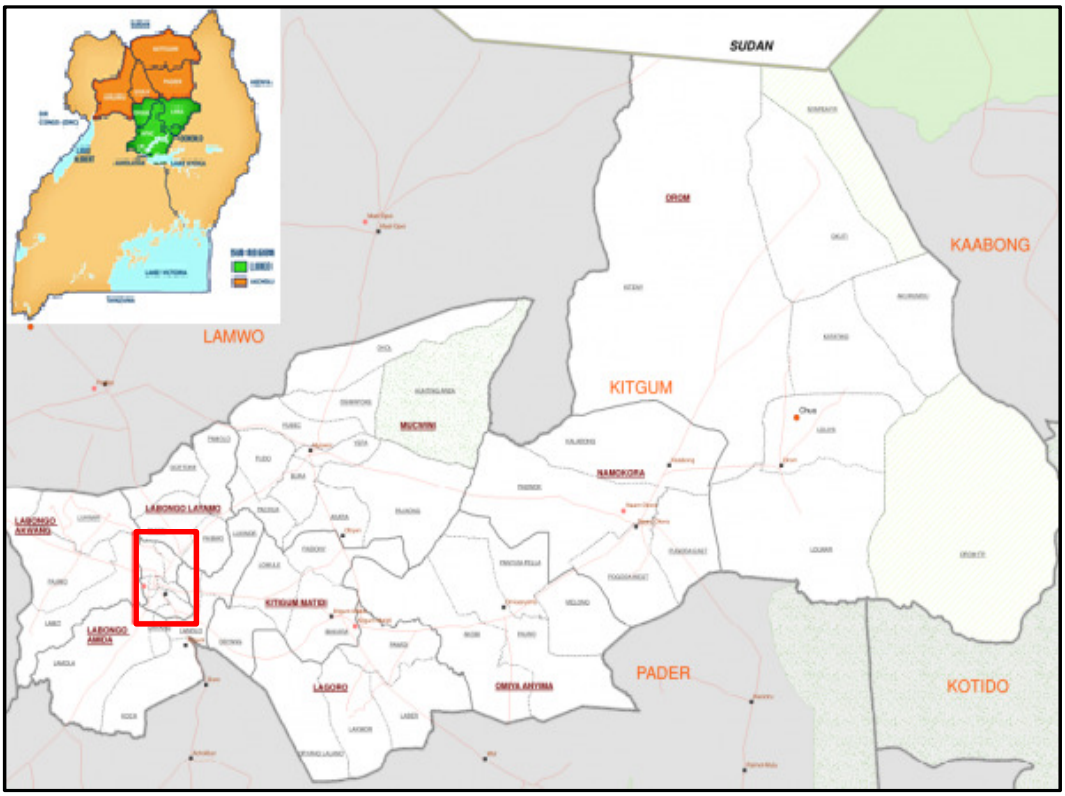

Figure 3. Kitgum-Lamwo district planning map. Red framed area corresponds to Kitgum town council area. *(Source: UN Office for the Coordination of Humanitarian Affairs. http://unocha.org/)*

2.2 GEOLOGY AND SOILS

Kitgum-Lamwo is the most northern district of the region. Its total surface is 9,773.63Km^2, out of which 7,818.9Km^2 are arable. The remaining surface is covered by forest, swamps and small rivers.

The district is generally flat, with gentle hills and its vegetation is mainly woody savannah, characterized by woody cover and grass layer. Is underlayed by granitic and metamorphic rocks of the basement complex, including rocks of quartzite, schist, amphibolites, charnockites, phyllites and mylonites.

Soils types in the district vary according to the locality, but four main regions can be distinguished, according FAO classification:

- Leptosols are predominant in Northwestern and Western regions, limited in depth with a continuous hard bedrock layer within 25cm from the surface and containing less than 10% of fine earth to a depth of 75cm. These soils are susceptible to erosion, because of continuous water logging and desiccation cycles.

- Eutricregosols, present in Northern regions of the district. These soils are characterized by shallow, medium- to fine-textured, unconsolidated parent material that may be of alluvial origin and by the lack of a significant soil horizon formation because of dry climatic conditions. They use to lay under the original natural vegetation, elephant grass (*Pennisetum purpureum*) or limited dry land crops.

- Vertisols and Plinthosols are common in Central regions. Vertisols are dark-colored soils, characterized by a clay-size-particle content of 30 percent or more by mass in all horizons of the upper half-meter of the soil profile by cracks at least one cm. They contain high levels of nutrients, but, owing to their high clay content, are not well suited to cultivation without painstaking tillage.

- Plinthosols, defined by a layer containing an iron-rich mixture of clay minerals and silica that hardens on exposure into ironstone concretions (plinthite), starting at 50cm from the surface. The impenetrability of the plinthite layer restricts the use of these soils to grazing or forestry.

- Eastern regions are defined by Lixic Ferrasols, red and yellow weathered soils resulting from an accumulation of metal oxides, particularly iron and aluminum. They have low fertility and require additions of lime and fertilizer if they are to be used for agriculture. Pasture is the main use for these soils, after the original forest clearing, which is the traditional practice of Karamojan farmers.

2.3 CLIMATE

Climate pattern in Kitgum district is bimodal, with dry and rainy seasons. Rain starts in late March or early April an ends in November, receiving an average annual rainfall of 1,330mm. Raining peaks are in April and August. Dry season is hot and windy. It starts in late November and ends in March, but during September, there is a short brake in Rain season, with the same conditions of a moderate Dry season. Figure 4 shows the monthly average of precipitation collected in Kitgum district.

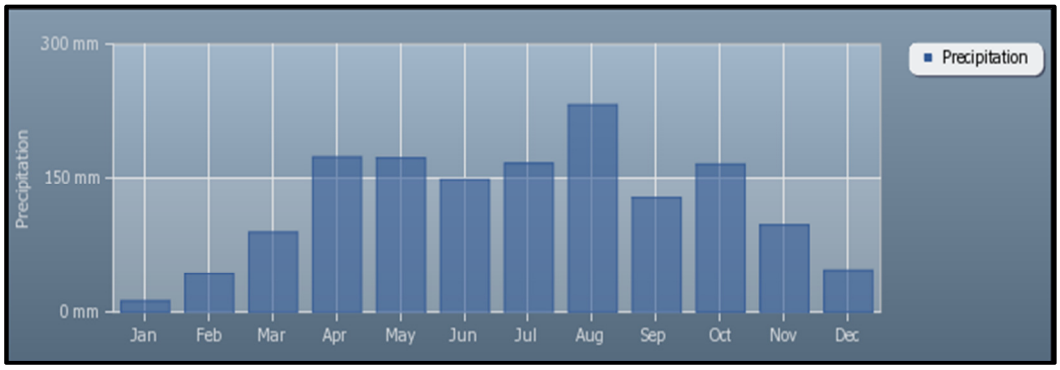

Figure 4. Kitgum district monthly precipitation chart. Average collected during the typical bimodal year. *(Source: Own elaboration from Kitgum Weather Station data).*

The average of rainy days during Wet season is about 18, and no more than five during Dry season. Figure 5 shows the monthly average of rainy days in a typical bimodal year.

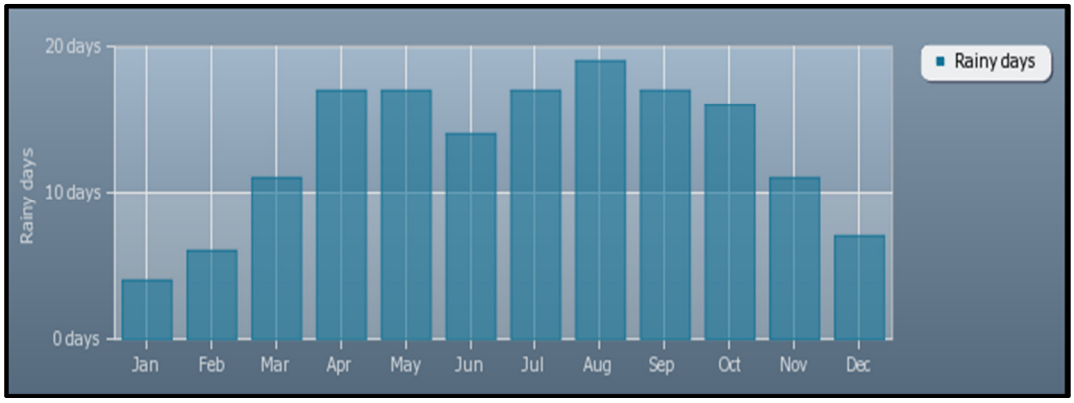

Figure 5. Kitgum district monthly Rainy days chart. *(Source: Own elaboration from Kitgum Weather Station data).*

The average monthly maximum temperature is 28°C, and 17°C for the average of monthly minimum temperature (Figure 6). Temperature peaks are register during Dry season in both maximum, with peaks up to 41°C, and minimum, with valleys up to 5°C.

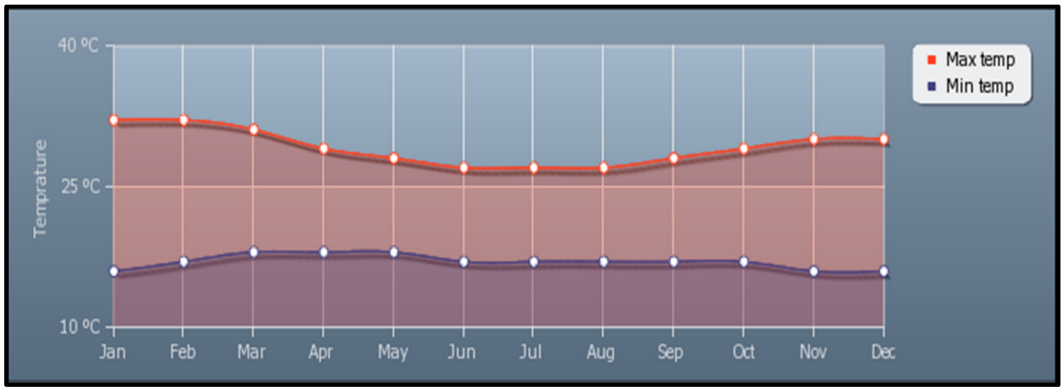

Figure 6. Kitgum district monthly Maximum and minimum temperatures chart. Average rate of the typical bimodal year. *(Source: Own elaboration from Kitgum Weather Station data).*

Relative humidity keeps a medium-high average during the year, close to 80% in Rain season, and suffering a significant drop, up to 40%, during Dry season, not only because of the lack of rain, but also because of the wind, reaching a monthly average of 4,2Km/h. Figures 7 and 8 shows the monthly average of relative humidity and wind speed for the typical bimodal year.

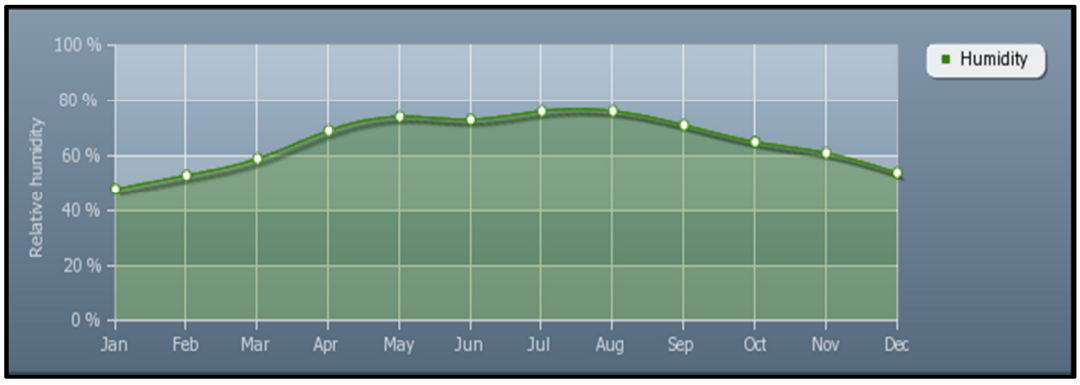

Figure 7. Kitgum district monthly Relative humidity average chart, for the typical bimodal year. *(Source: Own elaboration from Kitgum Weather Station data).*

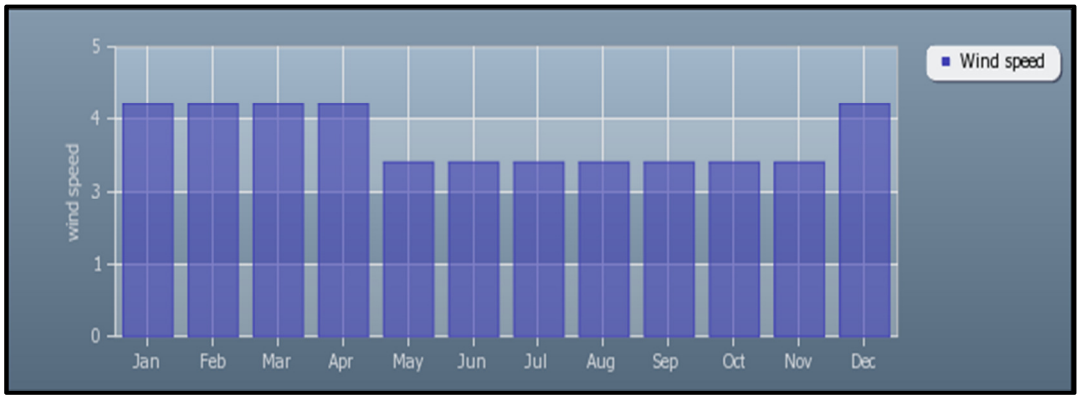

Figure 8. Kitgum district monthly Wind speed (in km/h) average chart, for the typical bimodal year. *(Source: Own elaboration from Kitgum Weather Station data).*

The number of sunlight hours is more or less constant over the year, about 280-290 hours per month, but with a valley of 200 hours from July to August. Figure 9 shows the average number of sunlight hours along the typical bimodal year.

Figure 9. Monthly sunlight hours average in Kitgum district chart, for the typical bimodal year. *(Source: Own elaboration from Kitgum Weather Station data).*

During the past ten years the dynamic of the climate pattern in Northern Uganda has been suffering a change towards a unimodal model, with longs Dry seasons, from mid-November to mid-May. These periods are dryer and hotter than the typical bimodal dry season, with recorded peaks up to 45^{o}C and with barely precipitations. These changes are not well described due to the variability of their incidence rate, alternating bimodal patterns with unimodal models randomly.

Wet seasons of unimodal pattern have recorded higher rates of precipitations, up to 450mm of monthly average, compared with the 300mm of the bimodal pattern.

These climate changes have significant impacts on local agricultural systems, with crop varieties not adapted to that long periods of drought and forcing farmers to adapt their practices to the new patterns and cycles.

2.4 STATE AND SOCIO-ECONOMIC ANALYSIS OF THE REGION

2.4.1 BACKGROUND, ARMED CONFLICT AND POST-CONFLICT SITUATION

The conflict in Northern Uganda waged by the Lord´s Resistance Army (LRA) against GoU forces, along 20 years –from 1986 to 2006-, displaced 93% of Kitgum population both internally and outside Uganda.

The key drivers of the conflict, according to the Advisory Consortium of Conflict Sensitivity (ACCS, 2013) were: Regional instability, economic disparities and unequal distribution of wealth, resource competition, poor governance and democratic deficits, human right abuses and erosion of civil liberties, politicization of ethnic identity, lack of truth, reconciliation and transitional justice, North-South fault line, corruption and personal greed, and tension between cultural institutions and government.

These regional-level conflict drivers affecting the North contributed to a collective sense of a marginalized and neglected region, along with an acute poverty, high youth unemployment, and socio-economic and political exclusion were the triggers of insurgency against government forces.

War in Northern Uganda displaced 1.8 million people, both internally and outside the country, causing one of the largest migration movements caused by armed conflict in Sub-Saharan Africa during the decades of 1990 and 2000, in 2006. LRA and GoU signed the Peace treaty, setting the base for the peace recovery in the region, and the resettlement of displaced people.

After the peace agreement, that has been violated several times, the GoU designed a program to restore the stability in the region. Known as Peace Recovery and Development Plan (PRDP), the program is assisting the return and rehabilitation of communities and institutions affected by the conflict.

The plan was set in two stages. PRDP I, from 2009 to 2012, is focused on two goals:

- Consolidation of State Authority: provides security to the people through reestablishing the rule of law and rebuilding state institutions in the region. It is implemented mainly by the Ministry of Internal Affairs, Ministry of Defense, Ministry of Justice and Constitutional Affairs, Uganda Police Services and Uganda Prisons Services.
- Rebuilding and empowering communities: aims at improving the livelihood of the people, including internally displaced persons, through active community recovery and development activities. It

is implemented mainly through special programs and NGO activities. District local government authorities coordinates and these, while the Ministry of Local Government provides overall policy directions.

PRDP II, from 2012 onwards is oriented to the long term stability. It is driven by two strategies:

- Rehabilitation of the economy: To reactivate the productive sector and particularly production and marketing, services and industry. A rehabilitation of infrastructure is necessary to achieve it. It is implemented by the Ministry of Agriculture, Animal Industries and Fisheries, the Ministry of Water and Environment and the Ministry of Works and Transport. Special Programs and NGOs are also actively contributing to this objective.
- Peace building and reconciliation: aims at improving access to information and counseling services by the population, increasing utilization of conflict-resolution mechanisms and a strengthening of local governance and informal leadership structure which can mitigate arising conflict. It is mainly implemented through sector agencies like the Amnesty Commission working closely with district local governments, sector ministries and NGOs.

The program is being performed in a satisfactory way, but has only been implemented in the main localities of the region. This means that a large number of groups and individuals still disenfranchised from the gains of transition from war to peace, and may resort to violence in order to survive, with serious impacts on the peace process. It is important to note that 95% of return has yet to occur in Acholi region.

Resettlement in Acholiland, especially in Kitgum district, is costing more effort to GoU than in the rest of districts, because it was the heart of the insurgency and a large number of active members of LRA still present in the area, with significant influence over the population.
The main challenges to be faced on the district are to ensure the security of population and the relocation of the one million people living in IDPs camps in a vulnerable situation.

2.4.2 SOCIO-ECONOMIC BACKGROUND

Acholi traditional society is sedentary and agricultural, organized by chieftaincies and ruled by a common law divided in two social stratums: *Kaka pa rwot*or 'powerful people', and *Dano,* 'regular people'. Each chieftaincy is formed by a group of different size villages and the land surrounding, where agriculture is carried out and The *Rwot*or sovereign exercises authority through the *Jokal*, or chairman.

Religion has strong presence in the social structure and home life, comprising a complex system of social rules, costumes and traditions used as a nexus between living people and dead world to satisfy their gods.

Despite maintaining their traditional religious believes, about 90% of acholi population are Catholic, 8% are Muslim and 2% Jewish and Hindu.

POPULATION AND FAMILY STRUCTURE.

Officially known as Acholi sub-region, Acholiland comprises Amuru, Gulu, Kitgum-Lamwo and Pader-Agago districts, and its total population add up to 1,256,200 people, according to the last census done by the Ugandan Bureau of Statistics in 2010/2011 (UBOS,2011).

Sub-region population is allocated in four groups: Resident, Returnee 1 (to origin villages), Returnee 2 (to Satellite Camps), and internally displaced person, living in IDP Camps.

Should be noted that Satellite Camps are those semi-settled temporary villages where residents inhabit for several months, primarily during rainy season in order to grow food.

Original villages in close proximity to IDP camps or UPDF quarters have also been considered as Satellite Camps.

As shown in Table. 3, most of the population is formed by Returnee 2, being a 44.29% of the sub-regions total, with greater presence in Pader-Agago district (64.89%). The largest number of Residents is located in Kitgum-Lamwo district (34.63%), while Gulu has the higher percentage of Returnee 1 population

Table 3. Population groups in Acholiland, in percentage

District	Residents	Returnee 1	Returnee2	IDP
Amuru	9.50	51.30	36.96	2.25
Gulu	9.38	73.27	10.97	6.37
Kitgum-Lamwo	34.63	16.80	47.16	1.42
Pader-Agago	21.56	13.55	64.89	0.00
Total	**20.28**	**33.39**	**44.29**	**2.05**

(Source: Own elaboration from UBOS data, 2011).

The impact of the largest number of IDP in Gulu is due to be the reference trade center and main Market not only of the sub-region, but also of Northern Uganda.

Sub-region population is characterized by been young, with and age average of 14 years for women and 13 years for men, trend that does not differ from the national population age average in which 51% of women and 54% of men are under 15 years.

Population density in the sub-region is low, with the highest densities gathered in the main towns, mainly Gulu, distantly followed by Kitgum, with 48 inhabitants per square kilometer.

Kitgum town population density rate has an average of 6,434.4 inhabitants per square Km, but is not a representative figure; due to the close by municipalities have an average between 90 and 130 inhabitants per square Km. (See Document 2. Plans).

The characteristic of Acholi sub-region population is the low proportion of men between 20 and 34 years old, due to the prolonged war, and the child population below five years old, due to the high child mortality and low fertility rates; being malaria, malnutrition and diarrhea the main causes of child mortality.

Demographic distribution shows in Figure. 10 presents an expansive pyramid structure, typical of developing countries, with high birth and mortality rates, and high natural growth; with a balanced proportion between men and women and young population predominance.

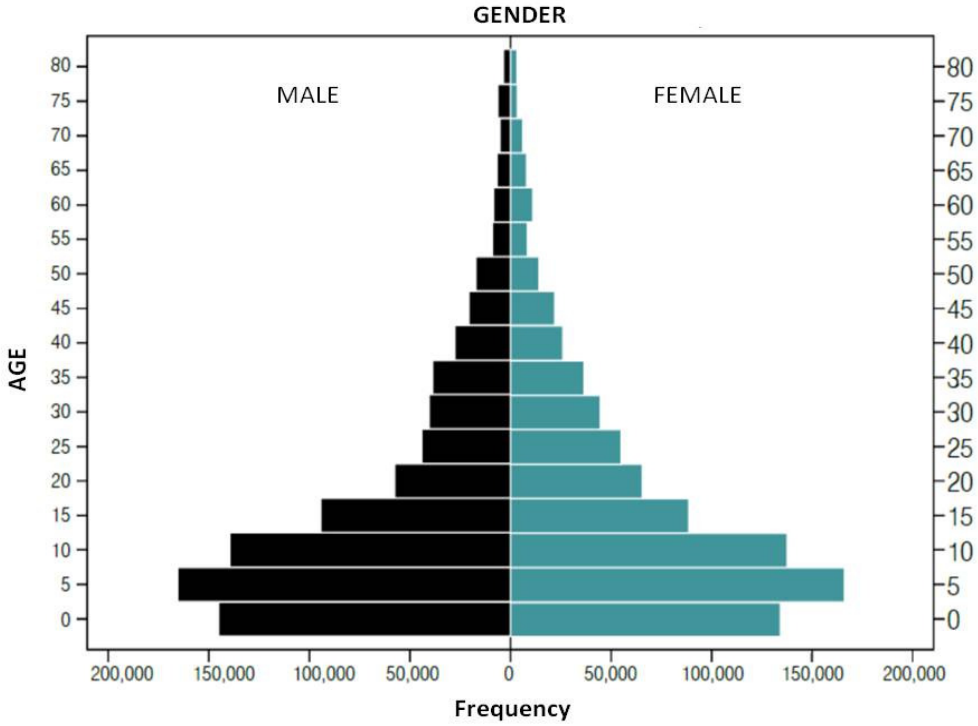

Figure 10. Gender distribution in Acholi sub-region. *(Source: UBOS, 2011).*

The typical acholi family count with an average of 8.14 members, and trends to a larger presence of women than adult men, while exists higher proportion of boys than girls per family unit. Table.4 shows the results by district.

Table 4. Size and composition of Acholi families by district

Members	Amuru	Gulu	Kitgum-Lamwo	Pader-Agago	Average
Men	1.04	1.13	1.26	1.17	1.15
Women	1.21	1.20	1.29	1.25	1.24
Boys (<18)	3.01	3.27	2.74	2.82	2.96
Girls (<18)	2.78	2.94	2.76	2.69	2.79
Total	**8.04**	**8.54**	**8.05**	**7.94**	**8.14**

(Source: Own elaboration from UBOS data, 2011).

Rate of families with a male householder is close to 85%; meanwhile only 15% of the families have a female householder. Results by district are shown in Table 5.

Table 5. House head distribution by gender and district, in percentage

District	Male	Female
Amuru	86.45	13.55
Gulu	81.21	18.79
Kitgum-Lamwo	86.28	13.72
Pader-Agago	83.98	16.02
District average	**84.55**	**15.45**

(Source: Own elaboration from UBOS data, 2011).

From the total of the region families, 11% have a widow/ widower householder, 9.85% an elder, 8.11% depends on social services, 5.25% a disabled, 1.81% an economically well positioned householder and 1.70% an HIV affected person. Table 6 summarizes data by district.

Table 6. Families distribution by householder status, in percentage

District	Disabled	Social services	Economically able	HIV/AIDS affected	Widow/er	Elder	Regular
Amuru	3.43	23.50	0.69	0.51	10.46	6.00	55.40
Gulu	3.91	2.13	0.00	0.71	9.95	13.85	69.45
Kitgum	5.14	6.81	0.90	3.73	8.87	10.28	64.27
Pader	7.12	3.56	4.15	1.38	13.75	9.50	60.53
Average	**5.25**	**8.11**	**1.81**	**1.70**	**11.07**	**9.85**	**62.21**

(Source: Own elaboration from UBOS data, 2011).

In a 99.28% of the cases, families are headed by an adult, meanwhile in only 0.72% of cases the householder is under age.

EDUCATION.

In terms of Education, Acholiland is below the average of Uganda due to the economic, political and social marginalization of the northern population by GoU.

The literacy rate of Kitgum district is 32%, partly due to the 20 year war suffered in the sub-region, partly to the lack of infrastructure. The quality is low, with inadequate classrooms, teachers, and desks. Several indicators of the poor status of Education infrastructure in the district are:

- Ratio pupil-classroom is 63:1.
- Ratio pupil-teacher is 60:1.
- Ratio pupil-desk is 5:1.
- 44% of schools have access to safe water at distances beyond one kilometer.
- Pupil attendance rate is 68%.

The number of total schools in the district is 142. There are 116 Primary schools, 22 Secondary schools and two Tertiary schools. There are only two special needs schools in the district: Saint Joseph Blind School and Glory Special Needs School. Both of them only offer primary education. The district has five Vocational/Technical centers and only five are early childhood education centers (see Document 2. Plans).

Technical subjects are being taught in secondary and vocational/technical schools; these include building, carpentry, joinery, mechanics, tailoring, agriculture, technical drawing, home economics and small business training.

All primary schools in the district are Public, and about 50% of secondary schools are Private. The number of young pupils moving from Primary to Secondary/Vocational school is 2,000 annually. From this total, 35% are girls and 65% boys.

Gender inequality in Education still being a challenge to be faced by GoU. In early primary education, there are often more girls than boys, but when families cannot afford the education fees, the use to choose their sons to continue with studies, giving the traditional role to women (Reinikka and Collier,.2010).

ECONOMIC ACTIVITY.

Main source of incomes for most of sub-region population (56.8%) comes from Agriculture and products-by selling. Rest of activities that represents an income source for the families are: temporary jobs (17.73%), forestry products selling, mainly fire wood and charcoal (14.19%) and liquor production and selling (4.68%). Fishery or arable land renting represents only the 0.07% of families' economic contributions.

84.75% of Amuru population lives from agricultural products selling, representing the higher percentage amongst the four districts, followed by Gulu and Kitgum-Lamwo. Highest rates of forestry products selling are reached in Pader-Agago.

Livestock and products-by selling do not exceed 1%, except in Kitgum-Lamwo district (1.38%), because Kitgum society is predominantly agricultural. This superior percentage in Kitgum-Lamwo is due to its proximity to Kaabong and Kotido districts, Karamajong ethnic, with great livestock tradition and reference centers, along Karamoja, of the so-called Ugandan Cattle Corridor.

Other income sources are trade, with an average of 1.38% in the whole sub-region, but reaching a maximum of 3.14% in Gulu, because of being Acholiland most important city and reference Market; relatives money sending (1.31%) and steady work with stable salary (0.87%).

Related to the distribution of economic activities according to the population groups mentioned above, should be noted that most of temporary jobs are carried out by IDP, as could be seen in Table 7. Agricultural products selling stands out among the rest of activities as main income source activity in the four districts; especially for Returnee1.

Table 7. Source of incomes by population groups in the region, in percentage

Main income	Residents	Returnee 1	Returnee 2	IDP
Farming products selling	51.03	70.85	52.80	53.33
Livestock selling	1.03	0.41	0.70	0.00
Occasional work	20.72	12.05	20.57	33.33
Salaried employee	1.03	0.93	0.70	1.67
Money transfers	0.86	1.85	1.24	0.00
Trade	1.54	1.75	1.01	3.33
Liquor elaboration	6.16	3.60	5.05	5.00
Land selling/renting	0.00	0.10	0.08	0.00
Forestry products selling	17.47	8.44	17.78	3.33
Fishing	0.17	0.00	0.08	0.00

(Source: Own elaboration from UBOS data, 2011).

Classified as Wood Savannah region, forestry product selling as fire wood, charcoal, and timber for house construction is supposing a serious environmental problem in the whole sub-region, due to the uncontrolled tree felling.

Most business is linked to Agriculture, being able to find agricultural products selling points, small seeds warehouses and tool shops. Also abound stalls, specialized in meals preparation, where any kind of products and services could be found, from hairdresser to electronic devices reparation.

Micro-business, family or single-owner are the most common in the sub-region, constituting 70% of the total of the established business; as long as there are any presence of large business. Figure 11 shows the business distribution, according to the size (Quisumbing and Pandolfelli, 2009).

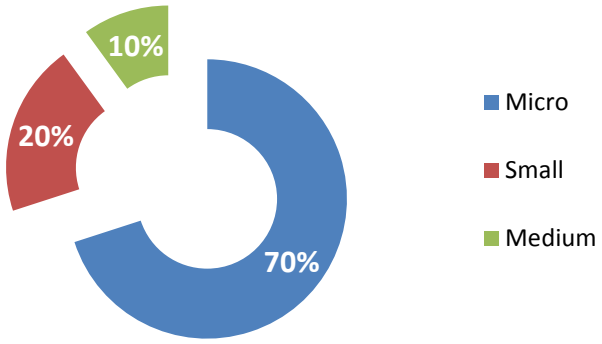

Figure 11. Business distribution by size in the region. *(Source: Own elaboration from UBOS, 2011 data).*

About 40% of small size business, and nearly all medium size business are owned by foreign population. Asian community, mainly Hindu and Pakistani, has a strong presence and influence on Trade; gathering about 85% of medium size enterprises, and focusing almost solely in electronic, household items and textile business.

LAND ACCESS.

Being Agriculture and product-by selling the main sub-region source of incomes, is necessary to know the whole scenario of access to land and its different uses. To get access to these data, World Food Program (WFP) in collaboration with FAO, and through DED Refugee/IDP Program conducted a research (WFP, 2009) in which a representative 2% of the sub-region total families were sampled, meaning 3,805 families surveyed.

From the total of the surveys, 997 were conducted in Amuru, 994 in Gulu, 867 in Kitgum-Lamwuo, and 947 in Pader-Agago. The research was carried out in 53 sub-counties of the sub-region, covering the 10% of each sub-county villages.

According to the results reported in the study, 80% of families acquired their lands for free by inheritance or relative assignment. Between three per cent and 14% of respondents they appropriate for free the land now possess; and only from two to six per cent of surveyed families have a renting contract on the lands

they utilize. Bought land cases are about one per cent. Few cases of tenure by settlement acquisitions were registered.

Table 8 below shows the several ways of land acquisition and its representative percentages in Acholi sub-region.

Table 8. Land acquisition systems in the region, in percentage

District	Purchase	Heritage	Rent	Acquired for free	Settlement	Do not know	Others
Amuru	0.86	84.19	6.19	8.76	0.00	0.00	0.00
Gulu	0.88	93.52	2.45	2.98	0.18	0.00	0.00
Kitgum	2.41	85.19	1.77	10.25	0.00	0.13	0.25
Padder	0.88	82.11	2.74	14.27	0.00	0.00	0.00
Average	**1.28**	**85.54**	**3.10**	**9.95**	**0.03**	**0.03**	**0.07**

(Source: Own elaboration from UBOS, 2011 data).

To the owned land sizes, the vast majority of the households (75.7%) have plots of less than 2.5 acres (1 hectare); while less than 20% have plots from 2.5 to 5 acres. Table 9 summarizes the data obtained by means of plots average sizes:

Table 9. Plot distribution by size in the region, in percentage

District	Plot sizes (acres)			
	<2.5	≥2.5 <5	≥5 <10	>10
Amuru	79.6	16.5	3.3	0.6
Gulu	89.0	9.1	1.9	0.0
Kitgum-Lamwo	73.1	21.3	5.2	0.3
Pader-Agago	67.7	24.7	6.2	1.4
Average	**75.7**	**19.1**	**4.5**	**0.6**

(Source: Own elaboration from UBOS, 2011 data).

From the total of families surveyed, and referring to fertility and soil quality, 55% described it as acceptable, 35% as good and the 9% as poor. Table 10 shows the obtained results by district

Table 10. Soil quality perception by district, in percentage

District	Soil quality		
	Poor	Acceptable	Good
Amuru	18	54	28
Gulu	8	59	33
Kitgum-Lamwo	6	50	44
Pader-Agago	8	57	34
Average	**9**	**55**	**35**

(Source: Own elaboration from UBOS, 2011 data).

AGRICULTURE IN ACHOLILAND.

With 84.6% of rural population, has to be understood that Agriculture constitutes the economic engine of the sub-region. Subsistence farming is the main trend.

Despite acholi has better access to land comparing to national average and the relatively good fertility and quality of soil, the plots utilized are small, using family as labor and hoe as main tool. The poor tillage practices, reduced to weeding and stubble burning after harvest, the absence of fertilizers inputs and the broadcast sowing trend, make Agriculture a less productive activity.

With a little extended use of animal traction to till the land and practically without mechanization (Table 11), almost the whole population practices a low yield traditional agriculture.

Table 11. Land tillage methods, in percentage

District	Hoe	Animaltraction	Mechanization
Amuru	99.31	0.52	0.17
Gulu	97.45	2.55	0.00
Kitgum-Lamwo	93.54	6.34	0.13
Pader-Agago	94.90	4.90	0.20
Global	**95.88**	**3.98**	**0.14**

(Source: Own elaboration from UCA, 2012 data).

As Table 11 summarizes, tractor use is isolated and use to be linked to large cooperative farms or big production companies.

Regarding to Acholiland majority crops, are mainly cereals and legumes, well climate adapted and turned during wet and dry season. Less extended are oilseeds, tubers and cash crops. Fruits and vegetables have limited presence in local markets, excluding cabbages, having to be imported from other regions, which makes them expensive.

The main crops grown in the sub-region and the most consumed seed varieties are summarized in table below.

Table 12. Acholiland main traditional crops

	CROP		VARIETIES
CEREAL	Sorghum	*Andropogum sorgum sudanensis*	*Epuripur, Sekedo*and*Serena*
	Maize	*Zea mays*	*Longe 4, Longe 5, UH5354, UH5301, Nalongo and Salongo.*
	Fingermillet	*Eleusine coracana*	*Serena, Pese-1, Seremi-1, Seremi-3.*
LEGUME	Ground nut	*Arachys hipogaea*	*Serenut, Red beauty* and *Egola*
	Bean	*Phaseolus vulgaris*	*K131, K132*, *Lango, NABE-4 and NABE-5.*
	Pigeonpea	*Cajanus cajan*	local varieties Long and short
	Soya	*Glycine max*	*Nam I* and *Nam II*
	Cowpea	*Vigna unguiculata*	Local varieties and *Large white*
	Mungobean	*Vigna radiata*	Localvarieties
TUBER	Cassava	*Mannihot esculenta*	*Karibuni, Kibanda-meno, Nzalauka, NASE-0, NASE-12, NASE-14* and *Bao*.
	Sweetpotato	*Ipomoea batatas*	*Ejumula, Kakamega, K566632, Naspot9 O* and *Naspot 10 O*
	Potato	*Solanum tuberosum*	*Bumbamagara, Victoria, Kimuli* and *Napkot 5*

(Source: Own elaboration from UCA, 2012 data).

Cassava, sorghum and millet are, by far, the most produced crops in Kitgum district, as Figure 12 shows.

There is a big gap between the two most consumed crops in the Northern region –cassava and sorghum- and the rest of crops. Cassava production reaches the highest value in Kitgum amongst Acholiland producers, with 25,800tonnes/year. Pader has the greater production in sorghum, with 21,460tonnes/year. Ground nuts and sesame reach values of 13,200 and 10,500tonnes/year respectively.

The use of local varieties is predominant amongst Acholiland farmers (Figure 13), in spite of its low yields, due to their adaptation to the climatic conditions of the sub-region.

In cash crops, as cotton and tobacco, the improved seeds have more presence, due to their higher costs of production and their economic benefits. Mixed seeds are not well accepted by Acholiland farmers.

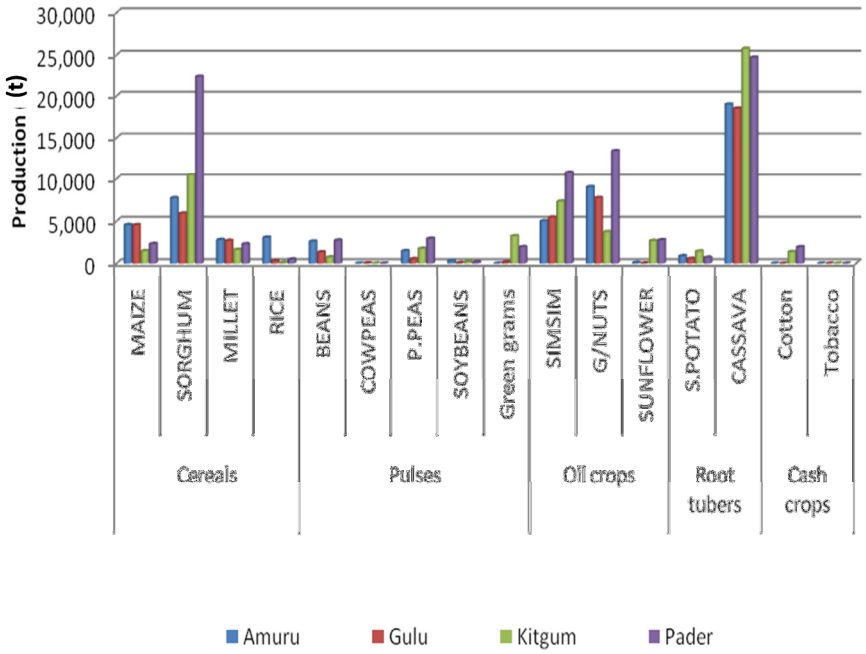

Figure 12. Crop production by district, in metric tonnes. *(Source: Own elaboration from UCA, 2012 data).*

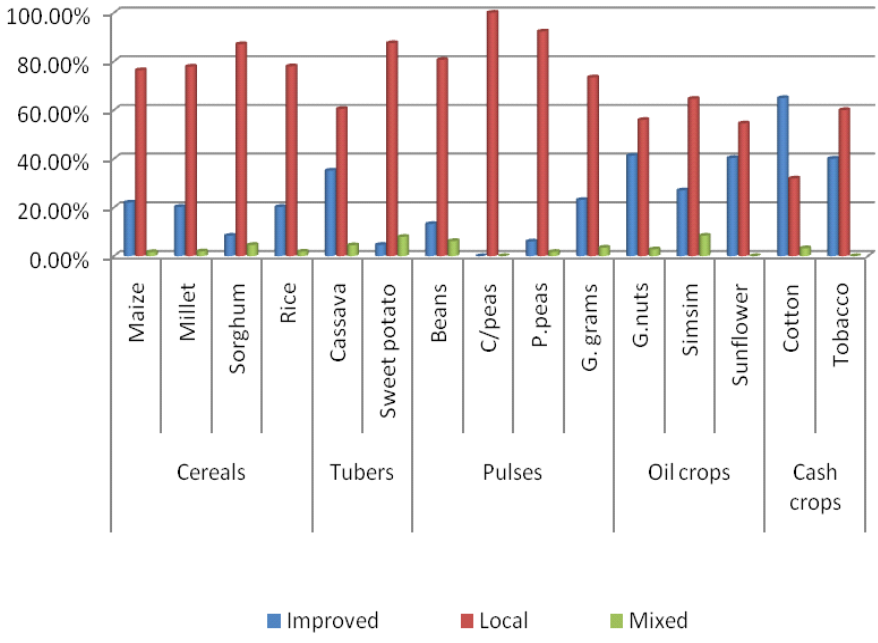

Figure 13. Seed types use in Acholiland farm systems. *(Source: Own elaboration from UCA, 2012 data).*

HEALTH STATUS

Kitgum district has one of the poorest health status indicators in Uganda, and on the other hand, the highest population growth rate.

From the health status indicators below, the population of Kitgum has poor health as compared to the National level. Many factors contribute to this, and include:

- The broken community structures due to the insurgency.
- Poor economic and social activities.
- Partly operational rural health facilities.
- General underdevelopment in the region.

The Infant Mortality Rate (IMR) in the district is higher than the national level, with 106 deaths per milliard, and an Under 5 Mortality Rate of 279 per milliard. The total number of assisted deliveries as percentage of expected deliveries rises up to 45.2%. This lack of assistance makes the Maternal Mortality Rate reach a share close to 35%.

The burden of disease is mainly communicable diseases and, therefore preventable, including malaria, acute respiratory infections, pneumonia, intestinal worms, acute diarrheal conditions, gastrointestinal conditions, malnutrition, HIV/AIDS and skins diseases.

The leading causes of death amongst children are malaria, malnutrition, pneumonia, anemia and septicemia; while among the adults HIV/AIDS is the main cause, followed by malaria, pneumonia, anemia and tuberculosis.

The prevalence of HIV/AIDS amongst severely malnourished children admitted in therapeutic feeding wards in district hospitals is 14.7%.

Malnutrition is significant due to limited food availability. The regular diet of an average Kitgum inhabitant has a calorie intake of 2,247Kcal/day in men and 1,385Kcal/day in women, according to the Society for International Development (SID, 2009). It estimated that these values fall by almost 30% during dry season, reaching the daily intake of 1,573Kcal in men and 987Kcal in women.

The diet is mainly based on cereals, especially maize, millet and sesame, beans, cassava and cabbages. Onions, tomatoes and fruits are less common, and meat is barely present in Kitgum inhabitant diet. When it is present, it used to be as chicken. Milk and products-by are not present.

3. MAIN AGRICULTURAL POLICIES

Different policy frameworks have been operating in the Ugandan Agriculture since 1995, sometimes simultaneously, affecting the performance of the sector.

With the drawn of the *Poverty Eradication Action Plan* (PEAP), in 1995 and replaced in 2008 by the *National Development Plan* (NDP), the action lines of the Agricultural policy framework were defined, which are:

1. Increasing household incomes.
2. Enhancing the quality and availability of farming employment.
3. Improving the stock and quality of economic and trade infrastructure.
4. Increasing access to quality social services.
5. Promoting innovation and industrial competitiveness.
6. Harnessing natural resources and the environment for sustainable development.
7. Strengthening good governance and improving human security.

The main goal of NDP has been the restoration of Agriculture as economic engine, generating employment, reducing poverty and improving the sector industrialization.

Sector investments have been guided by the *Plan for Modernization of Agriculture* (PMA), oriented to poverty reduction through agricultural commercialization since 2000 (MAAIF, 2010).

The PMA was designed as a multi-sectorial approach to agricultural development, based on the recognition that some of the investments needed to make a difference in Agriculture lie outside the mandate of the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). However, the implementation of the Plan showed several activities coordination problems between MAAIF and Agencies.

As a result, the five interventions under the PMA, namely, Agricultural research, Advisory services, Rural infrastructure, Agricultural education, and Sustainable natural resource management were not all implemented.

In 2005, the *National Agricultural Research Organization* (NARO) and the *National Agricultural Advisory Services* (NAADS) were approved by Ugandan Parliament, to support the implementation of the PMA. It supposed a great expansion of the program, covering most districts, and the definition of new gaps:

- The need to provide financial services to farmers to enable them to buy agricultural inputs (Rural finance).
- The need for farmers to add value to their products, as well as to improve access to market (Agro-processing and marketing).

For covering these gaps, along the five PMA interventions, MAAIF designed in 2005 the *Rural Development Strategy* (RDS, 2005), with three main objectives:

1. Increasing farm productivity of selected commodities.
2. Increasing household outputs of selected agricultural products.
3. Adding value and ensuring a stable Market for agricultural products.

To achieve these goals, the RDS work streams were:

- Provision of support to farmer groups.
- Enhancing rural micro-finance service provision.
- Establishing a Community Information System (CIS).
- Enhancing market access for agricultural products.
- Facilitating delivery of agricultural inputs through market mechanisms, including dealer/processor credit.
- Enhancing agricultural productivity through demand driven agricultural extension.
- Agro-industrial development through enhance support to research and development of agro-processing prototypes and implementing appropriate producer-processor linkages.
- Enhancing Quality controls and assurance through support to the Ugandan National Bureau of Standards.

Since 2010, and replacing RDS, MAAIF is performing a new agricultural policy, the *National Agriculture Policy* (NAP, 2010), guided by six principles derived from the previous experiences. These principles are:

1. The GoU is pursuing a private sector led and Market oriented economy. In doing this, the government works on constraints that hinder the private sector to invest in Agriculture.
2. Agricultural development will be pursued according to the 2004 zoning strategy that divided Uganda in ten agricultural production zones. Commodities that are best suited for each zone will received extra public sector support. Efforts will be made to support the value chain development.
3. Agricultural development services will be provided to all farmers categories as individuals or in groups, ensuring gender equity.
4. Government will continue to provide agricultural services through the decentralized system of government, increasing its collaboration with District and Sub-county Local governments.

5. Government interventions will pursue Growth and Equity and will be balanced across the different regions, agricultural zones, and across gender.
6. Government will ensure that key agricultural resources, including soil and water, for production are sustainably used and managed.

The reality is that the existing decentralized policy does not assist interaction between MAAIF and Local governments, with no proper links and limited members of staff.

3.1 AGRICULTURAL EXTENSION SERVICES IN UGANDA

The overall development goal of the NAADS Extension Services program has been to assist Ugandan farmers, no gender difference, to be able to adapt improved farming practices –technology and management- to enhance their productive efficiency and household welfare in a sustainable way.

NAADS is a long-term program, planned to take phase in stages. First stage was designed for the period 2001-2007, with a budget of $108 million. Due to the gaps identified in 2005 and the subsequent implementation of RDS, the stage was stretched on to June, 2010.

The second stage was planned for the period 2010-2015, under the Agricultural Technology and Agribusiness Advisory Services (ATAAS) supervision, with a budget of $450 million.

NAADS was a popular program with many resources, but it was used as an electoral tool to mobilize rural votes and to please lower level factions of the ruling coalition (Kjaer and Joughin, 2012), especially after 2006 and under the new multiparty constitution. Despite 71% and 43.2% of farmers demanded for extension services in crop and animal husbandry respectively (Muwanika et. al, 2010), the program suffered several interruptions since 2010, and finally was cancelled after 2011 General Election.

To overcome the negative impacts of the agricultural policy reforms, the GoU restructured the national extension program, as part of the PMA, from unified public extension to a public-private partnership (PPP). This reform involved the privatization and liberalization of the service delivery, in which the farmer is expected to pay some of the cost of the extension.

The model does not meet the reality of the country, in which more than 80% of the farmers cannot afford the extension services fees, evidencing the financial sustainability of the program.

NGOs are playing an important role in the delivery of the extension services to small scale farmers, as extension agents in the targeted areas not covered by PPP. Extension programs delivered by NGOs –especially local ones- are more dynamic, flexible and effective than GoU policies and public services offering technical support, with greater direct impact on less accessible communities, but with programs guided by donors and strategically aligned to donor's short term funding cycles.

Trying to face up the demands of rural population for a sustainable development, NGOs efforts have been aimed to work, in partnership with local governments and

farmer organizations, on the design of local impact agricultural policies and programs to satisfy the needs of each locality in both short and long term.

Thereby, extension services delivered by NGOs has taken another dimension, further than technical support to farmers, offering advice and guidance to decentralized local governments on agricultural strategies.

4. PARTICIPATION ANALYSIS

This section diagnoses the different actors involved in the reality where the project plans to intercede, and defines with accuracy the stakeholder population as well as the people affected by.

4.1 PROJECT STAKEHOLDERS

This project has been designed to have several impacts in Kitgum Town Council population at different levels.

The direct stakeholders of the project were the 137 boarding pupils of Glory Special Needs Primary School, which will benefit from the outputs produced in the Agricultural Training Center.

They are considered as the first impact level of the project, to reach in the short term. The goal to achieve at this level is to ensure and diversify the diet of these children.

The school gathers children with disabilities from all over the district. Some of them are orphans or have been abandoned by their families, but most of the pupils have the support of their families. From the total of pupils, 42 live in the center during the whole year because they do not any family support.

Figure 14. Some boarding pupils from Glory Special Needs Primary School. *(Source: Own elaboration).*

The center will be open to Kitgum Town Council community to facilitate the integration of disabled people in the society. Thereby, the stakeholders at this second level will be not only disabled people of the municipality, but also the rest of the neighbors of the parish.

Glory Special Needs Primary school is located in Alango Parish, Kitgum Town Council. The villages belonging to this parish are: Alango East, Alango West, Cam-

Cam, Tangi-Agoro and Oryang-Ojuma. These communities are the target of this project at the second impact level in the medium term.

The main market of the district is the one in Kitgum Town Council, which is three kilometers far from the location of Glory Special Needs Primary School. The long term aim of the Agricultural Training Center is to diversify the product spectrum in the Sub-county trough a market-oriented agriculture, to avoid the seasonality of the market and the import of vegetables and fruits from Central Uganda region. Achieving this will be ensured the availability of different products in the market during the whole year and the reduction of prices due to the local production of vegetables and fruits.

These two initiatives will promote the opening of new markets in different villages, with a reasonable variety of products at affordable prices, and more accessible to people living far from Kitgum Town Council.

The expected impact at this stage is to ensure the food security of the sub-county besides to stimulate its economy.

The indirect stakeholders at this third long term level will be the population of the Sub-county.

4.2 LOCAL AUTHORITIES AND OTHER ACTORS

To understand the interaction between Agriculture and the social live in Kitgum Town Council, several local government actors were met.

District Chairperson, L. Nyeko, was met to talk about the Kitgum society situation, main challenges to face by the district and weakness of current development policies.

The main outcomes from this meeting were:

- The district has been slowly recovering from the conflict between LRA and GoU, but its society still suffering the consequences of the war. The scarcity of social services, especially Education and Health, and the lack of proper infrastructures are the main challenge to tackle.

- Insecurity is one of the biggest problems in Kitgum. Karamajong raiders and some active LRA groups are causing significant damages and people displacement in Orome sub-county.

- IDP relocation is a big challenge to the district.

- Economic activities should be diversified. People still in resettlement processes, practicing subsistence farming and selling forestry products-by, as charcoal and fire wood, as source of incomes.

- Several farmer groups' initiatives have had significant success, as Kitgum Beekeepers Association and Moonvoyna Cotton Farmers.

In order to know the agricultural sector performance and opportunities in the district, the District Agricultural Officer, A. Peters, was interviewed. During the meeting, the main points to highlight were:

- Agriculture employs about 80% of people in the municipality. Almost 75% of the total is women.

- Agricultural yields are low in the district due to the combination of local varieties and bad management practices. Yields are getting lower due to the changes in climatic patterns.

- Farmer still practicing subsistence agriculture, without inputs as fertilizer. There are no extension services in the district. All the extension programs are carried out by NGOs.

- Local agriculture is focused in the four main traditional crops: Millet, sesame, cassava and beans.

- Some farmers have invested in cotton growing, but the overuse of the soil first, and the drought suffered during the past years has strongly affected to this crop.

- The district cannot invest in Agriculture, so is delegating to farmer groups and NGOs in taking the initiative.

- There is no greenhouse or Agricultural Training Center in the district.

The District Education Officer, O.H.Torach, was interviewed to understand the situation of disabled people in the district. Some outcomes of this meeting were:

- Education is one of the main challenges to face by the district. Kitgum has reached a rate of 100% in Primary education enrollment, but levels in Secondary still low. Tertiary Education is unapproachable for the majority of the population. Literacy rate in the district is about 36%.

- After Primary, most of the families cannot afford the fees of secondary education, so children begin to work at an average age of 13. Most of them are dropouts.

- Women still playing a secondary role in Education, especially after Primary.

- The Education quality levels are low, due to a lack of infrastructure and a poor preparation of teachers.

- Disabled pupils have difficult access to education. There are only two schools in the whole district prepared for special needs education, and that is not enough to satisfy the real needs. This is caused by the stigma that the society have on disability.

- Vocational/Technical centers are the best way to pupils to continue their studies. There are catering, tailoring, bakery, electronics, technology, building, carpentry and mechanics training centers in the sub-county, but no agricultural ones.

The last of the interviews was done to the Kitgum District Farmer's Association (KDFA). This is a research association subsidized by Kitgum Local Government, and that works in improving the agricultural status of the sub-county. From this meeting the following outcomes were taken:

- Kitgum Agriculture still being a subsistence activity spinning around the four main traditional crops: Millet, sesame, cassava and beans.

- Local farmers trust on local varieties and refused to buy improved ones; thereby, incidence of crop diseases still high.

- Local and traditional practices are barely sustainable. The common practice in eastern part of the district is to run the soil fertility out and deforest a new plot for the next crop.

- Is a common practice not to use any kind of crop input, as fertilizers or pesticides.

- Hoe is the main tool, animal traction does not exist in the district. There are few tractors in the region and are used in large cultivations of cash crops as tobacco and cotton.

- NERICA rice trials have been satisfactory in Northern Uganda and could be a good choice for growing in Kitgum district.

- Sunflower production is gaining in importance, but there are not infrastructures to process the seeds into oils.

- Water use and land management are the big challenges to face by district farmers.

- KDFA is quite open to collaborate with NUCBACD and its Agricultural Training Center.

The local authorities agreed on the great need of an agricultural training center in Kitgum, emphasizing the importance of opening the center to communities

and encouraging the integration of disabled students through a system of ´merit scholarships´ only allocable to the best students in the municipality interested in acquiring such training.

Upon acceptance of the proposal, the challenges to consider were:

- Development of a curriculum according to the lines of the rest of vocational education centers elsewhere in the country, but starting from the experience and needs of the district. Determine the duration of the degree.

- Once approved this plan, enroll the center in the Ministry of Education to offer an official title.

- Defining a minimum age or training to allow access to grade.

- Recruitment of qualified teachers.

Once all this information was gathered, the next step was to visit various communities to understand the local production systems. The villages of Oryang-Ojuma, Lomorojo, Nyori, Palabak and Lamolo were visited, making a total of 61 families. The findings of these visits were:

- Millet, sesame and beans are the main important crops, followed by cassava.

- Maize is consumed daily, as porridge made out by flour, but is not common as crop. It is due to people prefers to move up to IDP camps to get their weekly portion of maize flour, especially in the communities of Lomorojo, Palabak and Lamolo.

- Main source of incomes of farming households comes from other activities as selling charcoal or firewood, or because one or several members of the family works in non-agricultural related activities.

- The main tool for tillage activities is the hoe, and the main sowing system is broadcast. No inputs are used in crops.

- Most of the farmers have not got incomes enough to purchase improved seeds. They keep seeds from one season to the next.

- Most of the farmers agreed that most of the time they produce for self-consumption, because the crop outcomes are not enough to have an excess to sell in the market.

- The average of plot sizes is less than one acre, but most of the families have a kitchen garden close to their houses.

- The farmers know how to recognize the plagues affecting to their crops, but do not know how to prevent or treat them.

- The main use for kitchen gardens is growing cabbages and Irish potatoes for self- consumption.

- Watering of kitchen gardens is done by buckets of potable water during dry season.

- Poultry is the main livestock activity, followed by goats keeping.

- Most of the farmers agreed that they could improve their crops production, but they will need training in agricultural management, as well as in household economy.

- Most of the farmers agreed that Extension Services in the district are limited and do not have coverage to the majority of communities.

- Most of the farmers agreed that they do not know or they did not have access to micro-credit programs.

Figure 15. Meeting with Nyori farmers. *(Source: Own elaboration).*

5. SWOT ANALYSIS

SWOT analysis give information about strengths, weakness, opportunities and threats from the studied background, to help in the design the strategy during the planning process.

With the information collected after the interviews, the SWOT matrix below was proposed.

Table 13. Glory Special Needs Agricultural Training Center SWOT matrix

STRENGTHS	WEAKNESS
High rate of young population in the district.	Low productivity of local systems.
Growing interest of direct stakeholders in Agriculture.	Poor quality of soils.
Strong educative and motivational component.	Subsistence agriculture.
Possible revenues generating source.	Working with extremely vulnerable groups.
Institutional and Farmer Associations support.	Strong rejection from the society to disabled people.
Integral founding of the infrastructure needed.	
OPPORTUNITIES	**THREATS**
Market seasonality.	Changing climate patterns.
Low variety of products in the market.	Unsteady agricultural policies.
High market costs of vegetables due to its import from Central region.	World economic crisis.
No Agricultural Vocational training centers in the district.	
First greenhouse in the district.	

(Source: Own elaboration).

6. PROBLEM ANALYSIS

The problem analysis is the main challenge of the decision making process, besides to be essential part of the action plan design. It requires a deep knowledge of the context reality and the understanding of the interactions between the different actors.

The problem tree (Annex I) defines the existing relations between the main problem identified and the rest of problems. It also lays the trigger causes down and the induced effects.

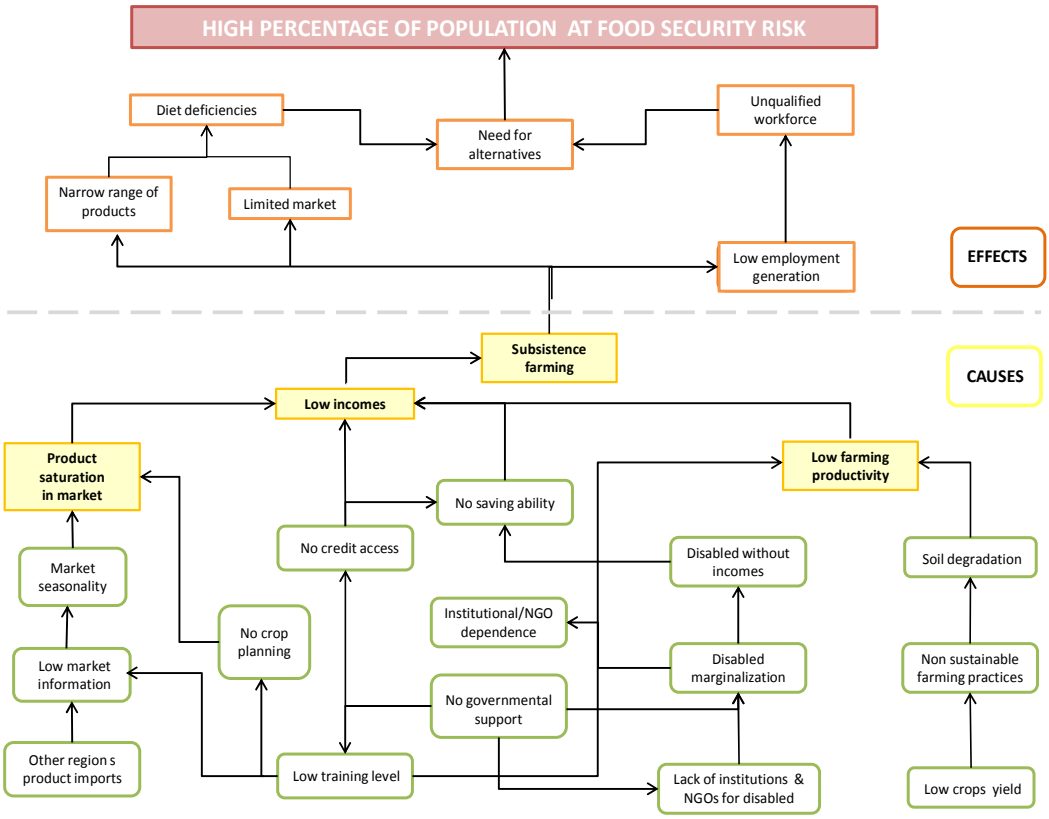

Figure 16. Glory Special Needs Agricultural Training Center project Problem tree. *(Source: Own elaboration).*

The problem tree tried to appraise the concerns of the Kitgum population through the meetings and interviews performed.

The main findings detected by Kitgum farmers were the main causes of the tree: Low farming productivity, product saturation in market and low incomes, because of the persistence of a subsistence farming system.

The problems detected during the meetings with farming associations and local government officers made the rest of the concerns net up, interacting to lead into the main real problems of the farmers' daily life.

7. TARGET ANALYSIS

The target analysis tries to describe the hypothetical situation which would be reached if all the problems were solved.

The targets tree (Annex II) translates the causes and effects from the problem tree into measures and aims, as goals to achieve for the success of the project implementation.

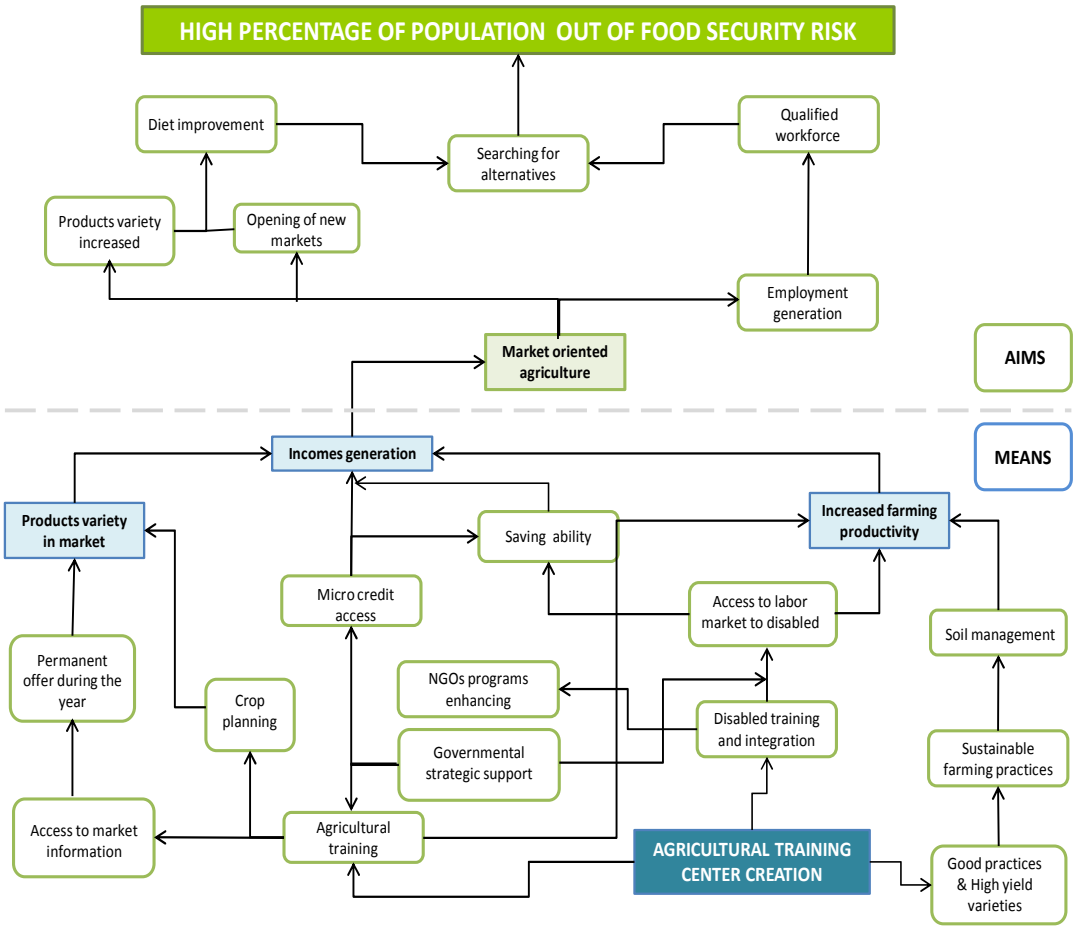

Figure 17. Glory Special Needs Agricultural Training Center project targets tree. *(Source: Own elaboration).*

The target tree analyses the effects caused by the implementation of the project. It was done to face up each single concern detected by three feasible and realistic main means that could be achieved through the running of an Agricultural Training Center.

The mid-term impact of this project will be to establish a market oriented agriculture system in the municipality which will allow to reach the main, and long-term, goal of the project: to ensure the food security status in Kitgum Town .

8. PROJECT STRATEGY DESIGN

Once the problem of the target population has been detected, analyzed and translated into feasible measures to satisfy the identified needs, is time to design the best strategy to tackle it.

Thereby, planning should be a decision making process, but also a communication process. All the actors of the project, including the stakeholders, should be informed about the objectives, alternatives and project mechanisms. Through communication, the stakeholders will feel more committed with the decisions taken.

The planning matrix shows the information of the project plan, expressing the most essential elements of planning, as well as is useful to monitoring the project performance through several indicators objectively measurable.

The project strategy designed for the present project (Table 14.) was elaborated along with the director board of Glory Special Needs Primary School, and approved by NUCBACD management board.

Table 14. Glory Special Needs Agricultural Training Center planning Matrix

	Intervention logic	Objectivelyverifiable indicators	Verification sources	External factors
GENERAL GOAL	**Reducing food insecurity in the medium term and ensure food safety in the long-term, providing Kitgum farmers skills to sustainably improve their standard of living.**	- Center farming activities performance. - Viability to develop an agricultural studies plan. - Viability to organize farmer groups in the municipality.	- General economic evaluation of the Center. - Decreasing of feeding costs due to the improvement of the productive ability of the Center. - Economic incomes source.	- Local policies. - Community interest in the integral development of the proposal. - Social acceptance. - Indirect costs/Inflation.
SPECIFIC GOAL	Strengthening of technical and human capabilities through an Agricultural Training Center in Kitgum Town Council.	- New facilities and improved infrastructure. - Improvement of the agricultural performance in the municipality.	- Agricultural reports. - Accounting reports. - Personal experiences of involved students.	- Local support. - Stakeholders' motivation.
RESULT	Use Agricultural training as an integrative tool for Youth with disabilities in the municipality enabling the interaction between disabled and non-disabled pupils.	- Development of an integrative syllabus. - Rate of non-disabled students in the center.	- Glory Special Needs Agricultural Training Center syllabus. - Annual enrollment sheets.	- Traditional Kitgum's inhabitant mindset.
	Developing a continuous production system capable to supply the Center.	- Yield increasing. - Diversification of crops. - Improved farmers' skills and practices.	- Farming activities and yield records. - Trial reports. - Glory Special Needs school food budget.	- Drought - Possible damages caused by local people.
		REQUIREMENTS	**COSTS**	**PRE-CONDITIONS**
ACTIVITIES	Consolidating and training a solid management team.	- Training of Center management staff in good management practices.	- Training material.	- Training will be performed by NUCBACD Central office in Gulu, Uganda.
	Developing a syllabus according to the local needs and Center Policy.	- Externaladvice. Qualifiedstaff. - Design rolesandresponsibilities.	- Personnelsalary. - Teaching materialscosts.	- Conditioning of Center facilities for no to interrupt Glory Special Needs Primary School activities.
	Installing a greenhouse to ensure practical training on intensive vegetables production in the Center.	- Staff training in greenhouse management. - Keep a record of the every activity carried out.	- Kit purchasingcosts. - Fencingcosts. - Rainfall harvesting pool setup costs. - Transportation costs. - Laborcosts.	- Perimeter fencing of location. - Ensuring water availability. - Due to the number of direct stakeholders, the location for a second greenhouse should be considered.
	Land purchasing to ensure practical training on food crops production in the Center.	- Available land surrounding the school. - Local government and private owner's licenses and contracts.	- Private owner land price. - Rental fees for Government plots. - Property registrationcosts. - Seedcosts.	- Plots conditioning according to the selected crops needs.

(Source: Own elaboration).

After define the strategy plan it was necessary to draw up a work plan to achieve the targets set out on it.

The operative plan (Annex III) was designed to be able to carry out several activities simultaneously, in order to expedite its implementation.

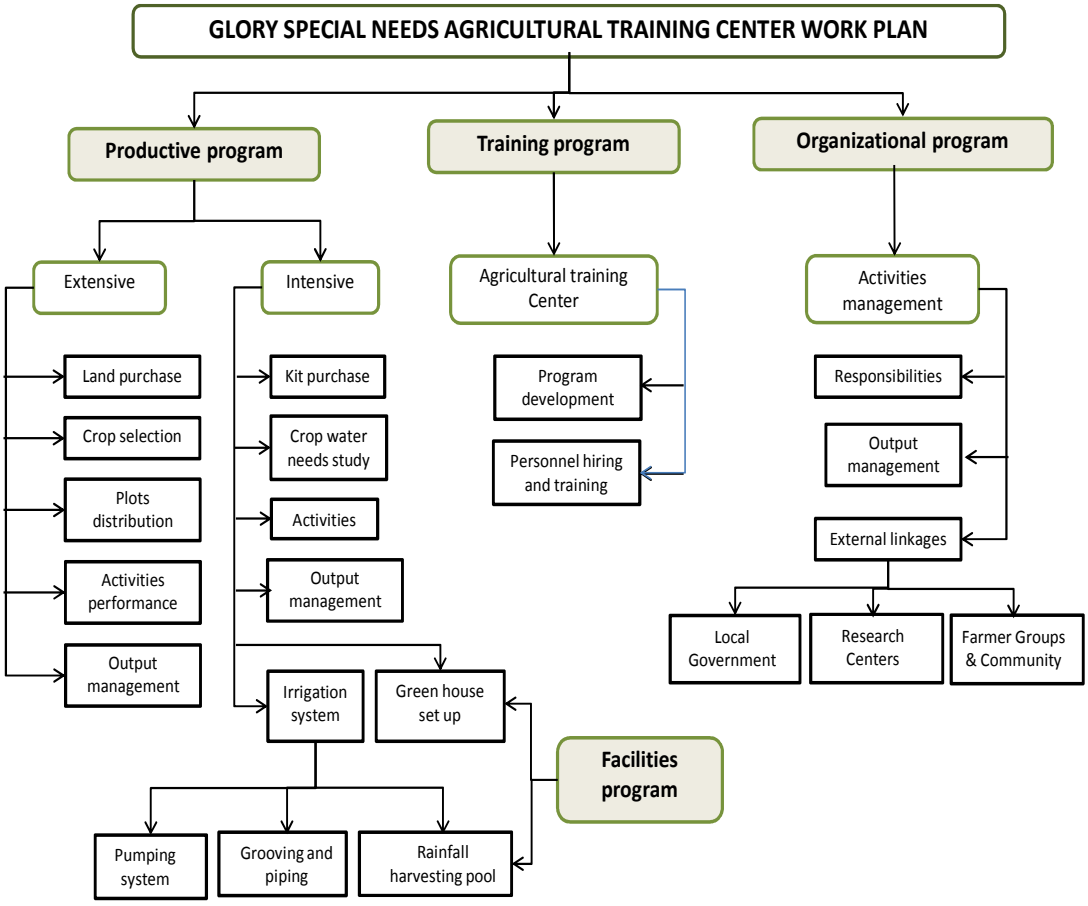

Figure 18. Performed operative plan for the present project.*(Source: Own elaboration).*

The activities carried out simultaneously, after the project identification stage and further explain below in this document, were:

-**First phase (August 2011- September 2011):** Land purchase, crop selection, plot distribution, greenhouse kit purchase and set up, crop water needs study, program development and networking.

- **Second phase (September 2011- October 2011):** Rainfall harvesting pool building, grooving and piping, pumping system installation and networking.

Agricultural activities have been excluded from this list. The rest of activities were developed as part of the regular running of Glory Special Needs Primary School.

III. PROJECT INTEGRAL DEVELOPMENT

1. PROJECT STRATEGY

By knowing that Education and Training are key-processes to the sustainable development of the society, Glory Special Needs Agricultural Center has been pointed to maximize its impacts on Kitgum Town Council inhabitants.

According to NUCBACD principles, and under its motto '*Disability is not inability',* the goal of the organization is to offer equal opportunities to disabled population and the rest of the community.

The main objective of the Center is bringing knowledge and professional skills to disabled and non-disabled people, in an inclusive way, using Agriculture as integrative tool to enhance farmers' abilities, stimulating income generation and improving their resources.

Figure 19. Glory Special Needs student holding the motto of the center. *(Source: Own elaboration).*

The action range of the program is Kitgum-Lamwo sub-county, with a direct impact in Kitgum Town Council community. The medium and long term expected impacts are:

- Progressive integration of disabled population in Kitgum Society and labor market.

- Local farming systems productive capacity improvement.

- To broaden available crops in the municipality, with new crops and varieties.

- To increase farmer incomes enhancing a market oriented agriculture.

- To strength farmer groups to get access to market, being part of the value chain system.

- To be regional reference at educative and agricultural levels, offering support to local farmers through Extension Service programs.

- To cooperate along with KDFA and Kitgum Farmer's House (KFH) to improve the institutional capability, creating new links which would lead to an effective and efficient diffusion of the program.

To tackle the different goals, two work streams were defined:

1) Agricultural Training Center set up: including land purchase, plot distribution, facilities and infrastructure, productive systems and crop selection.
2) Agricultural Training Center management: including licenses, management board and responsibilities, syllabus and networking.

1.1 VISION AND MISSION

NUCBACD is a Ugandan Nationally registered Non-Governmental Organization. Established and officially registered in 2005 by a small group of individuals who saw the needs of the communities of Northern Uganda increasing, one of those increasing, untouched, and culturally left behind needs being that of disabled children. With this particular population in mind -now registering over 15% of the total population of Kitgum District- this small group has endeavored through the last years to build up a centre for these children which serves as a day and boarding school for pupils at the primary level.

Along with the centre based teaching, learning and healing, this organization has broadened its scope in the last four years through adding another component to its programming; that of identifying, sensitizing and training not only more pupils which are deep in the communities but also their parents.

VISION: Equal opportunities for all children and youth with disabilities.

MISSION: To build a society that cares, rehabilitates and enpowers children and youth with disabilities.

1.2 CENTER POLICY

NUCBACD, through Glory Special Needs Primary School, has been providing assistance and primary education to disabled childhood and youth –mainly deaf- and war victims, since 2005.

GUIDING GOALS:

1. To promote and conduct special needs education among the children and youth of Northern Uganda.

2. To advocate for the rights of children and youth with disabilities in Northern Uganda.

3. To promote and conduct economically empowering vocational skills trainings among people living with disabilities within Northern Uganda.

4. To advocate for a strengthening of positive cultural values which foster understanding, care, and support of people living with disabilities.

Disabled people integration in Kitgum community life is the most important challenge of the organization, and the Center policy has been guided to face it through the sections:

- The Center will be open to the population of the municipality, but some vacancies –depending on the students- will be kept to Glory Special Needs Primary School students.

- The creation of a positive relationship with neighbors, surrounding communities and local interest groups will be encouraged.

- The Center will periodically inform to neighbors, surrounding communities and local interest groups of its activities and plans.

- Areas and activities of social, cultural, biological, environmental and/or religious interest to the community will be respected.

- Procedures for enquiry and evaluation of local population interests will be held, considering productive areas, operative changes or work streams that could be a negative impact on the community life.

- The Center should have procedures to prioritize the training and possible hiring of local labor, and the contract and acquisition of local products and services.

- Direct or indirect, full or part time, of workers under 16 will be forbidden.

- No worker between 16 and 18 years old could work more than six hours per day, or 30 hours per week. Their workday should not interfere with their educative opportunities. These workers could not perform any activity that may pose a risk for their health.

- No worker over age could work more than eight hours per day, or 48 hours per week. These workers could not perform any activity that may pose a risk for their health without the mandatory security measures.

- The Center should have with payment policies and procedures to ensure the correct payment of workers in the stipulated paying dates. Payment should be done in the facilities of the Center.

- The working hours, resting times during the day, vacation days per year, holidays and resting days should comply with the current labor legislation.

- No gender, origin, disability or religious beliefs will be done.

- Farmers will be allocated in mixed groups of disabled and non-disabled people.

- A sign language interpreter will be available for each group. Support in sign language will be offer to teachers and farmers that do not practice it.

- Scorn and/or rejection attitudes will involve the direct expulsion of the program.

- One of the points of interest of the Center will be natural resources, agricultural biodiversity and water and soil conservation and management, that will be managed through sustainable practices guide to a market agriculture.

- The center should contribute to community natural resources protection and conservation, collaborating to the development of the local economy.

- Measures to protect and preserve the municipality natural resources will be taken.

- The Center should collaborate with local research centers and competent authorities to reinforce environmental education policies, offering courses and organizing events to increase the awareness of local farmers.

- The Center will develop an Integrated Crop Management program, based on sustainable principles, to carry out its productive activities.

- The teaching model of the Center, based on Farmers Field Schools, will be participatory and interactive. The groups will use the Center facilities and will be oriented by qualified personnel.

- The Center will have a syllabus to ensure the effective execution of its environmental and social management systems.

- Teaching will be performed mainly on the field, but theoretical lessons could be included.

- Environmental conditions will define most of the program.

- Real problems given on the field will be observed and analyzed, from sowing to harvesting.

- Farmers should be able to go from be receptors of solutions to their own problems, to generate their own solutions.

- The Center will keep the production management rights, which will be aimed to feed the boarding pupils of Glory Special Needs Primary School, to improve their feeding and diversify their diet. Part of the production will be used to keep seeds for the next season.

- If above needs will be met, The Center could sell the production surplus, under approval of the director board.

- In order to avoid direct competition to local farmers, the Center could only sell its production surplus giving added value to the product, either as flours for cereal, or sauces, jam or canned food for vegetables. In any case, these products should meet the hygiene and food safety levels for being suitable for human consumption.

2. OPERATIVE PLAN

The operative plan, as seen above, developed both production systems, extensive and intensive, the setting up of facilities and infrastructure and the activities to perform in the Agricultural Training Center, as well as all the administrative issues related to its implementation.

The operative plan was every time aligned to the project strategy and the Center policy, defined above in this document.

This section will only describe the different activities carried out independently, to facilitate the understanding of the development of project.

Activity overlapping has been aforementioned in the section '*PROJECT STRATEGY DESIGN*' of this Document.

The project strategy and the project timing forced to the simultaneous development of several activities, especially during the early stages of the project implementation process.

Defined as *'The satisfaction of the present needs without compromise the capability of future generations to satisfy their ones, ensuring a balance between economic growth, environmental protection and social welfare'* (UNDP, 2007), Sustainability will be the main idea that links the two work streams of the project.

Figure 20 shows the sustainability action scenario and impact areas in its three key aspects: Social, Agricultural-Environmental, and Economic.

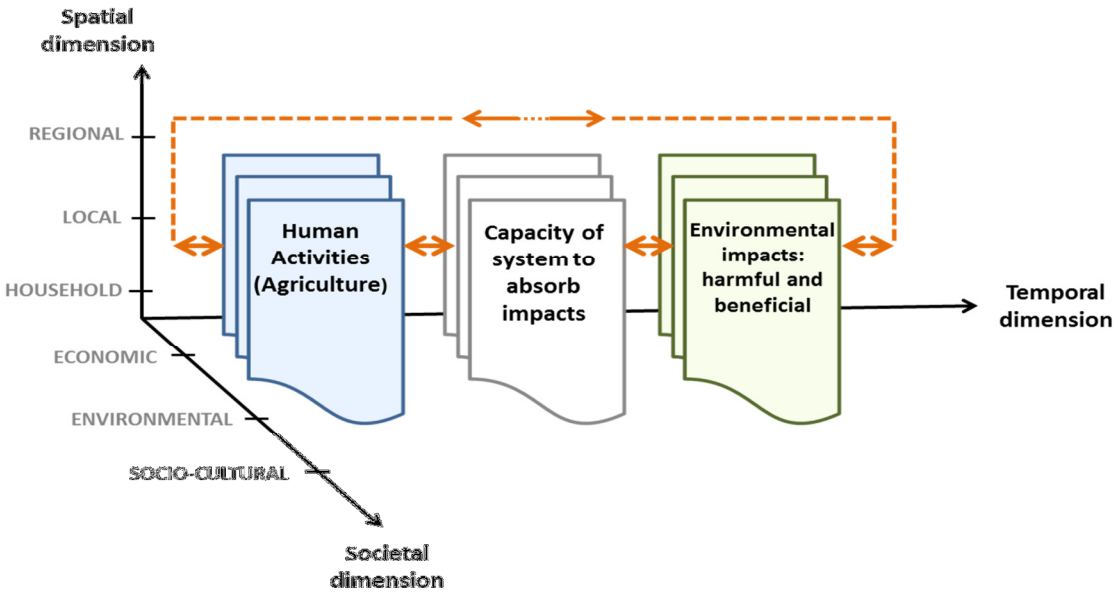

Figure 20. Project sustainability action scenario. Defines the impact areas of the sustainability of the project its dimensions *(Source: Own elaboration).*

The operative plan was divided in sections, based on the two aforementioned work streams, in order to avoid interferences in the global development of the project. There by, the following sections were defined:

1. Data collection, needs identification and proposal approach.
2. Extensive production system.
3. Intensive production system.
4. Center organization and management.

Data collection, needs identification and proposal approach stage has been defined above in this Document, so only the project location choice will be explained in this section.

2.1 PROJECT LOCATION

The Agricultural Training Center was located in Glory Special Needs Primary School facilities, separated from the school activities and with its own facilities. Thereby, it was named as Glory Special Needs Agricultural Training Center.

The decision to place the Center in that location was taken considering several aspects that Glory Special Needs Primary School could offer as advantages to the project. These key aspects were:

- The existence of facilities, with two classroom blocks, two warehouses, one kitchen and one office, to centralize and coordinate the activities.

- The existence of two parcels, property of the school.

- The existence of more available plots close to the school.

- The school is well known and respected in Kitgum, not only by its population, but also by local authorities and other organizations.

- The school is a reference center for disabled people from the region, so the access to the information and activities of the Center will be easier to them.

- The school is managed by NUCBACD under the supervision of the general coordinator of the organization.

The election of the Center location was a unanimous decision took both project' counterparties, NUCBACD and AmigoSolidarios Foundation, the project donor, ATTITUDE, and the direction board of Glory Special Needs Primary School.

2.2 EXTENSIVE PRODUCTION SYSTEM

Most of local farmers practices subsistence farming, with low yields and self-needs satisfaction and self-consumption oriented.

The general objective of this section was to provide the Center with the necessary tools to offer training in different crops, broadening farmers' choices to make more efficient use of their resources.

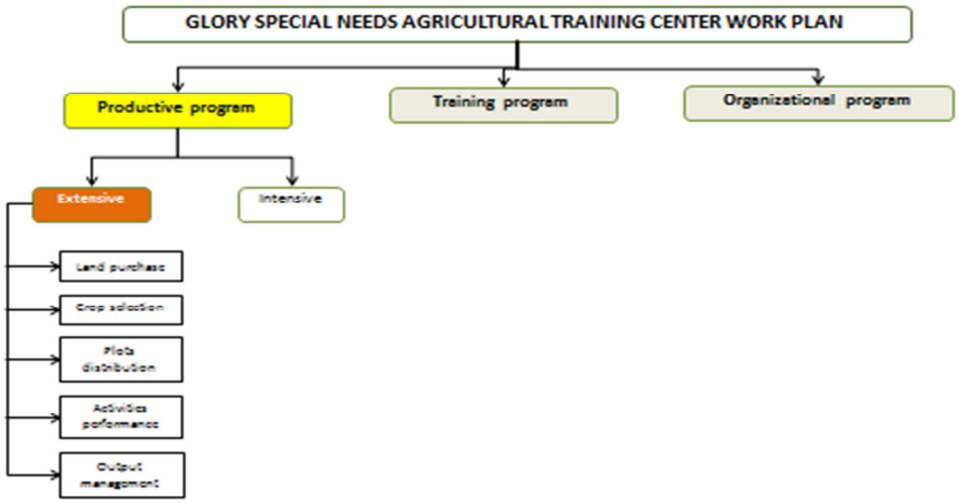

Figure 21. Extensive production program in the operative plan. *(Source: Own elaboration).*

2.2.1 LAND PURCHASING

Glory Special Needs Primary School already had access to two parcels, donated by Kitgum Town Council in 2006 (1) and 2009 (2) –see Figure 22- Despite to have them available without any cost, only one was under production (1), with broadcasted cassava. Plot (2) was abandoned.

Considering the low average yields of local crops and the relatively low prices of land in the district, it was decided to purchase more plots form the available surrounding parcels, to be able to increase the productive capability, not only by improving the traditional farming practices, but also increasing the available arable surface.

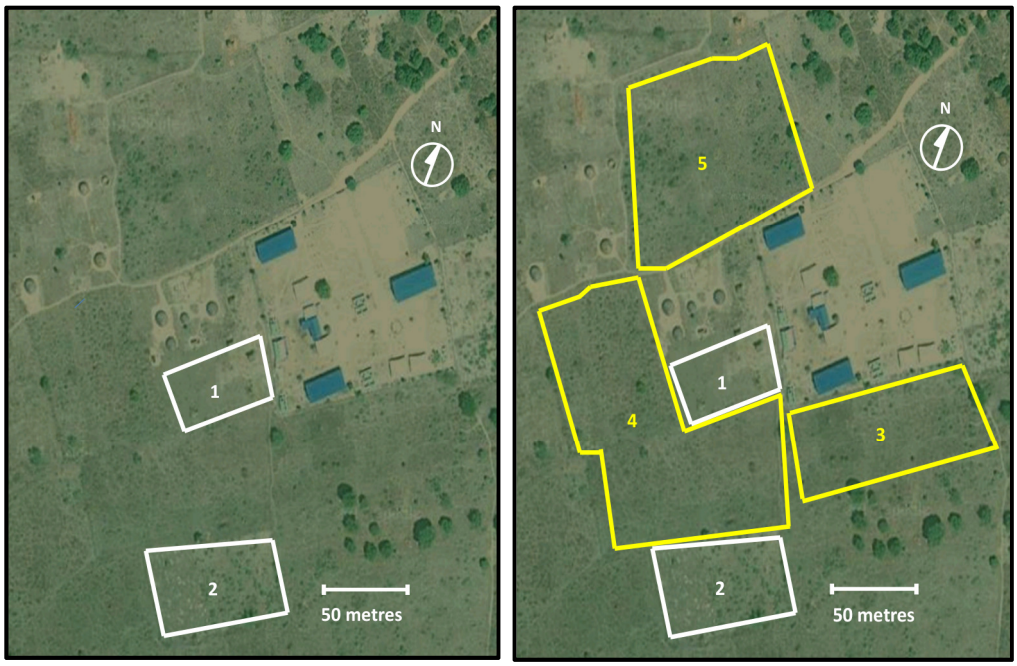

Figure 22. Smallholdings property of Glory Special Needs Primary School before (a) and after (b) purchases. Lots will be used as practical and experimental fields by Vocational Agricultural Training Centre. *(Source: Own elaboration from Google maps satellite information).*

Plots (3) and (5) were directly leased by Kitgum Town Council after several negotiations between NUCBACD, the District Agricultural Officer, the District Chairperson and the District Residents Committee.

The resolve of those meetings was translated into an agreement between the municipality and NUCBACD, whereby both plots will be granted in rent during five years, at half their renting price and with a buying right, after the agreed five years, at half the value by buying date.

Plot (4) was the result of the purchase of two different plots to two different families. The agreement signed by the families was the immediate acquisition of the parcels, due to they were not under production. The purchasing price was agreed according to the values assigned by the District Resident Committee, being classified as rural land.

The total amount spent in the rental fees during the first year of plots (3) and (5) and the purchase of plot (4) was 11,455,185.50UGsh. Table 15 shows the total expense in land acquisition.

Table 15. Total land investment in the first year. It includes Land purchasing and renting.

Amount (UGsh)	Lot 3	Lot 4	Lot 5
Total 1st year rent	1,887,500	-	2,297,200
Total purchase	-	6,725,000	-
Sub Total	1,887,500	6,725,000	2,297,200
Gran Total	**10,909,700**	**Gran Total (€)**	**4,040.60**

(Source: Own elaboration).

Plots (3), (4), and (5) acquisition led to an increase in 2.91ha of the arable land belonging to the school, from 0.64ha to 3.55ha. Table 16 shows the available surface by plot.

Table 16. Arable surface by plot.

Lot	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Total
Surface (ha)	0.24	0.4	0.65	1.3	0.96	3.55

(Source: Own elaboration).

The acquired plots, as well as the existing ones, would remain in property of Glory Special Needs Primary School by contract, but the exploitation rights were ceded to NUCBACD through Agricultural Training Center.

2.2.2 CROP SELECTION AND PLOT DISTRIBUTION

The decision for the selection of crops to produce was taken regarding to the natural resources and their availability (mainly soil quality and climate), the available supplies (seeds and varieties) and the local market situation.
The foregoing considerations that defined the decision making process, and which is part of the goals to achieve with this project, was:

- Glory Special needs Primary School food security should be ensured. Center production should be destined to improve the diet of the 137 boarding pupils, as well and quantity –necessary and sufficient-, as in quality –diversifying diet by increasing the variety of products available-.

- The Center should cover the integral training in different productive systems. The access to multiple plots should favor the simultaneous training in different crops and productive systems, in order to offer more alternatives to local farmers to better manage their resources.

- Traditional crops and systems should be respected. Such crops are well known and guarantee an easier access to local market, which will increase the farmers' opportunities to get better economic yield from their production.

Regarding to this considerations, the decision criteria were focused on the following aspects:

- Local seed varieties.
- Crop cycle duration.
- Growing habit.
- Intercropping possibility.
- Water needs and drought tolerance.
- Soil quality.
- Seasonality.
- High yield varieties.
- Market demand.

Rated these aspects, the selected crops and their distribution, as is shown in Figure 23, were:

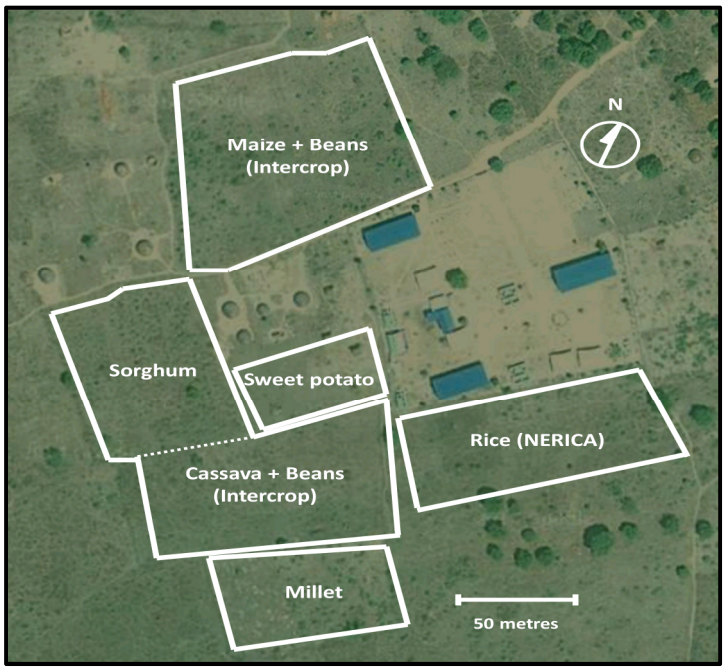

Figure 23. Selected crops and plots distribution.*(Source: Own elaboration from Google maps satellite information).*

The selected crops were chosen amongst the higher yield varieties available in Kitgum market. Three main factors were considered: Yield, Crop Cycle Duration and Drought Tolerance.

Values from zero to one were assigned to each variety, according to its response to each single factor and the available information from the supplier.

Assigned values for Draught tolerance were one for High tolerance, 0.5 for Medium tolerance and zero for Low tolerance. Higher scores were given to higher yields and shorter crop cycles. The highest average yield and the shortest cycle of each crop were rated with a value of one. Table 17 summarizes the seed selection process.

Table 17. Crop varieties decision making matrix

CROP	VARIETY	Yield	CropCycle	Drought tolerance	Total
BEANS	K131	1	0.4	0	1.4
	NABE-4	0.6	0.7	1	**2.3**
	Lango	0.8	1	0.5	**2.3**
SWEET POTATO	Eiumula	0.8	1	1	**2.8**
	Kakamega	1	0.7	1	2.7
	Naspot-9 0	1	0.5	0.5	2.5
MAIZE	UH5354	1	0.2	1	2.2
	Large-5	0.8	0.8	1	2.6
	Salongo	0.9	1	0.5	2.4
	Nalongo	1	0.9	1	**2.9**
MILLET	Pese-1	0.9	0.6	1	2.5
	Seremi-1	0.9	1	1	**2.9**
	Seremi-3	1	0.7	1	2.7
RICE	NERICA-1	1	0.8	1	**2.8**
	Suakoko	0.7	0.9	1	2.6
	ROC	0.8	1	0.5	2.3
CASSAVA	NASE-14	1	0.4	1	2.4
	Karibuni	0.8	0.9	1	**2.7**
	Kibanda-Meno	0.9	1	0.5	2.4
	Nzalauka	0.9	0.6	1	2.5
SORGHUM	Sekedo	0.9	0.9	1	**2.8**
	Epuripur	0.6	1	1	2.6
	Starwhite	1	0.7	1	2.7

(Source: Own elaboration).

The findings of the seed varieties analysis were, as can be seen in table above, as follow:

- For beans, NABE-4 and Lango varieties were the highest scored. The decision was to use Lango seeds, for being a traditional variety. Some NABE-4 seeds were bought for sampling and comparison trials.

- For sweet potatoes, Eiumula variety was selected.

- Nalongo variety of maize was rated as the best option due to its yield and drought tolerance. The crop cycle duration was also acceptable.

- Seremi-1 millet variety was selected by its crop cycle duration and drought tolerance. The yield still high in this variety.

- NERICA-1 rice is a proved variety that responses with a really good performance in upland's paddies. It was the selection for rice.

- Karibuni cassava is a Kenyan variety well adapted to the dry climate of Northern Uganda.

- Sekedo is a local variety of sorghum with high tolerance to drought, and relatively high yields and short cycles.

The characteristics of the selected varieties for the considered factors in the decision making process were, in average:

Table 18. Average characteristics of selected crops

Crop	Yield (kg/ha)	CropCycle (days)	Drought tolerance
Beans (Lango)	1,100	90-100	MEDIUM
Sweet potato (Eiumula)	4,200	100-110	HIGH
Maize (Nalongo)	6,000	110-115	HIGH
Millet (Seremi-1)	2,300	100-110	HIGH
Rice(NERICA-1)	6,750	90-100	HIGH
Cassava (Karibuni)	5,200	220-240	HIGH
Sorghum (Sekedo)	3,200	90-100	HIGH

(Source: Own elaboration).

2.2.3 FARMING ACTIVITIES CALENDAR

Due to the climatic duality of the region, alternating two raining seasons' years (bimodal) with years of severity drought (unimodal), a crop calendar was designed to cover both climate patterns. It was intended to produce under any climatic condition, offering the largest number of alternatives to farmers.

Figure 24 shows the crop calendar designed to carry out the extensive production system activities performance in the Center.

During May, June and July in unimodal pattern traditionally exists a lean season, due to the lack farmers' options in the region. The goal of the designed calendar was to cover that gap with different crops, as NERICA-1 rice and Nalongo maize, which are high drought tolerant crops that could provide an alternative to the local choices.

2.2.4 PLOT PREPARATION AND CROP SOWING

In order to prepare the plots and make them suitable to host the crops, and start the production ability of the Center to feed Glory Special Needs Primary School pupils, several tasks were carried out.

This process took place during August and was done with the collaboration of the NUCBACD CARE project stakeholders; a program that works with dropouts and war victims offering professional alternatives to them.

Plot (1), under a broadcasted cassava crop, was harvested and cleared, removing all the cassava plants.

The removed plants were kept to being used to take the steams as planting material.

For increase the possibilities of a satisfactory sprout, the steams were cut in 20 to 30cm long pieces, with five to seven nodes. The selected material came from healthy plants, and was carefully examined in order to prevent future plagues and diseases.

Once cleared, the plot was used to grow sweet potatoes. The ground was prepared in 60cm high ridges, with a separation of one meter in between them

Eiumula tubers were used to plant. Each tuber was cut in two pieces and stored in a sunny and humid warehouse to facilitate it sprout. After the sprout, the tubers were transplanted into the ridges.

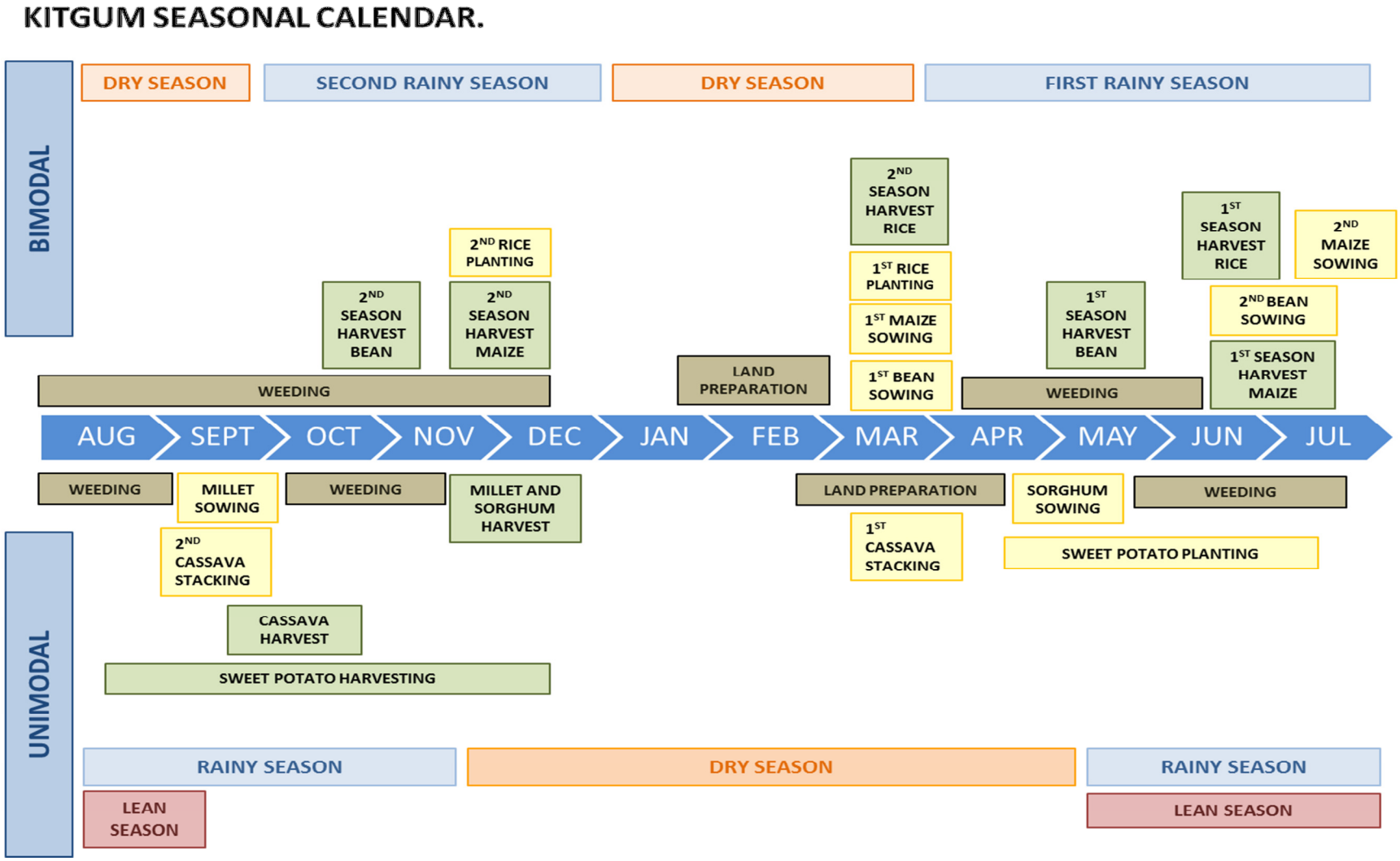

Figure 24. Glory Special Needs Agricultural Training Centre Seasonal Calendar, designed for covering farmer needs in both climatic conditions**.**
(Source: Own elaboration, based on FAO data,2011).

Sowing frame was 100x40cm, which an estimated plant density of 60,000plants/ha. Figure 25 shows the transplanting process.

Figure 25. Sweet potato transplanting in plot (1). *(Source: Own elaboration).*

The transplanting was done in early August, after the sweet potato planting season finished –by mid-July- but without several consequences to the crop.

Plot (2) was also cleared and prepared for host the millet crop. Tillage activities were carried out to suit the ground. It was plough and the vegetal material was incorporated as green manure. Figure 26 shows the process of ground preparation for millet.

Figure 26. Plot (2) tillage activities. The vegetable material was added to the ground and the trees were cut down. *(Source: Own elaboration).*

Millet was sowed in September, according to the crop calendar above. Separation between rows was 60cm, with a sowing frame was 60x20cm, which makes a plant density of 200,000plants/ha.

Due to the delay supposed by the negotiations on land acquisition, and to comply with the crop calendar and timings of the project, a tractor was rented to till plots (3), (4) and (5).

Plot (3) was used for growing rice. Rice was planted in late November. In mid-September the ground was fertilized with manure. During October, a second plough was done by the Agricultural Training Center pilot groups to set the soil up for the sowing.

Rice was planted manually, after growing the seedlings in a nursery bed. The planting frame was 30x15cm, with plant density of 240,000plants/Ha.

Figure 27. Rice in plot (3). *(Source: Own elaboration).*

Plot (4) was divided in two parcels. One was used for growing sorghum; the other one, for intercropping cassava and beans.

Cassava and beans intercrop was planted in early October. Cassava stacking was done with the planting material obtained from plot (1) clearing.

The planting frame for cassava stakes was 120x80cm, with a planting density of 10,375plants/ha.

Beans as intercrop alternative was chosen for being an undemanding improver crop, with a short vegetative cycle and the ability to fix nitrogen to the ground. Cassava-bean intercropping practice is well known and tested in tropical systems, with positive results for both crops.

Typical bean seeds sowing frame use to be 60x30cm, but in this case beans were sowed in between cassava rows, with a frame of 60x40cm (Figure 28).

The other part of plot (4) was kept empty until May, for the sorghum sowing. Ot was used as a trial plot in land management and good practices for keeping soil fertility by th epilot group during the running of the Agricultural Training program.

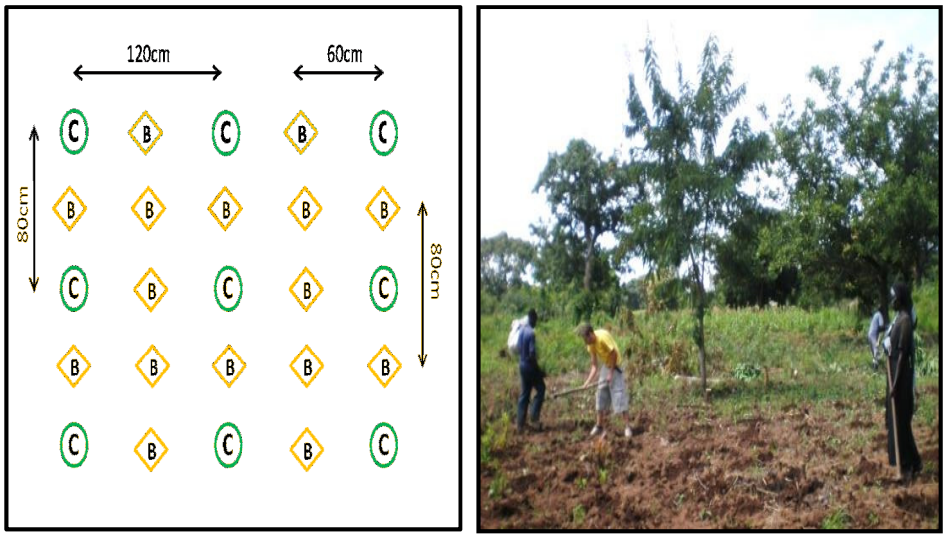

Figure 28. Cassava (C)-bean (B) intercropping drawing and Cassava stacking in plot (4). *(Source: Own elaboration).*

Plot (5) was intended to grow maize and beans intercropped. The seasson for maize sowing begins in March, coinciding with the first sowing of beans, but due to the climate, beans could be grown during any seasson if water is available.

For this reason, and regarding to the feeding capability of Glory Special Needs Primary School, it was decided to use plot (5) for growing beens from late November to February (Figure 29). Three positive inmediate impacts were achieved by doing this:

1. Using the educative capability of the plot by planting beans.

2. Improving the quality of the soil through green manure use and adding the vegetal material after the harvest.

3. Improving the feeding capability of the school, increasing the beans stock.

The watering during the early dry season came from the rainfall harvesting pool, and was watered by a treadle pump used as a sprinkler.

Figure 29. Bean growing in plot (5) during early dry season, as alternative for improving the feeding capability of the School. *(Source: Own elaboration).*

2.3 INTENSIVE PRODUCTION SYSTEM

Local agricultural systems in Kitgum mainly grow beans and grains. Due to the climatic conditions, soils quality and water scarcity only few vegetables are cultivated in the district.

The main vegetable crops in Kitgum district are cabbages *(Brassica oleracea var. capitata)*, okra (*Abelmoschus esculentus*) and tomato (*Solanum lycopersicum*), but the consumption habits of Kitgum inhabitants also includes carrots (*Daucus carota)*, eggplant *(Solanum melongena)* and peppers *(Capsicum annum)*. These vegetables are imported from Central region, where soils qualities are much better and there is not water scarcity.

Transport from Central region and the limited supply, increases the prices of these products, making them not affordable for most of the population in the district (e.g. price of three carrots in Kitgum market by 2011/12 was 3,200UGX, about 1.2€).

The lack of vegetables leads to a shortage of vitamins in Kitgum inhabitants, often is translated into illness, affecting especially to childhood.

Lack of vitamin A, B1, B2, C and K is common amongst Kitgum children population (Ministry of Health, 2010).

Improving the diet of the boarding pupils of the schools also entails to diversify it, covering the nutritional gaps and shortages.

To achieve this aim, as well as implementing the facilities and infrastructure to avoid the Agricultural Training Center offer a program in intensive production systems, the decision of build a greenhouse was taken.

Glory Special Needs Primary School pupils´ diet consists in three meals per day. Maize porridge in the morning, beans and *Kalo* (sticky bread made by maize flour) at lunch time, and beans and *Kalo* at dinner time.

Figure 30. Glory Special Needs Primary School daily menu, maize porridge in the morning, and beans and *kalo* for lunch and dinner. *(Source: Own elaboration).*

The nutritional value of this diet is extremely poor, especially for children. It was a priority to include vitamins in this diet to supplement it and improved the health status of the schools. Is known that the lack of vitamins in the diet has the following effects:

- Susceptibility to disease and interrupted sleep patterns.
- Blood clotting problems and anemia.
- Intestinal and digestive problems.
- Stunting.
- Academic underachievement.
- Poor dental health.
- Physical deformities (especially with lack of vitamins B and D).

To complement this diet, and according to the goals defined in this project, the crops to produce had to increase the nutritional value and diversify the diet of Glory Special Needs Primary School pupils as well as fit in a market oriented agriculture.

By knowing the Kitgum consumer preferences, the chosen crops were tomato, eggplant, pepper and carrot.

These crops also offer coverage of the documented vitamin shortage in Kitgum chilhood, as well as in Glory Special Needs Primary School students. The content in vitamins of these products is:

- Carrot: Beta-carotene (vitamin A), and vitamins E and K.
- Eggplant: Vitamins A, B2, B6, C, and E.
- Pepper: Beta-carotene, B2, B6, C and E.
- Tomato: Beta-carotene, B2, B3, B5, B6, B7, B9, C, E and K.

Figure 26 shows the activities of this program in the Operative Plan designed for the Agricultural Training Center.

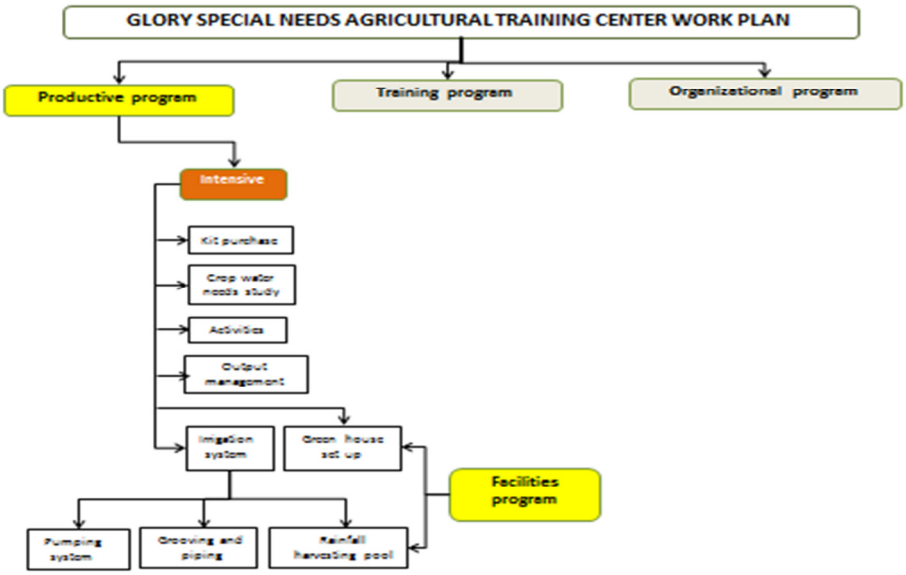

Figure 31. Intensive production system in operational plan. (*Source: Own elaboration).*

2.3.1 GREENHOUSE INFRASTRUCTURE

To comply with the defined timing for the Training Agricultural Center opening, it was decided to acquire a greenhouse kit.

The use of greenhouses represents an alternative in production and new marketing opportunities for products grown under these systems, in addition to providing protection from adverse weather conditions for crops they give better quality and higher production yields.

Protected agriculture, therefore, is one of the activities that are experiencing greater height in developing countries Agriculture, coming to regard major part of the economic performance of the sector.

Besides, modern agricultural systems are ecologically important because they allow a rational use of water resources and reduce the impact of chemicals used on the environment.

After contrasting the experience of a Kenyan company -Balton- dedicated to the installation of greenhouses in arid regions of East Africa, with successes in northern Kenya and South Sudan, and after contacting its office in Kampala-

Uganda Balton Ltd. - and check *´in situ´* one of its greenhouses under production, it was proceeded, in mid-August, to request a budget for the purchase and construction. Budget could be seen in Document 3.Budget.

This company sells a kit called Amiran Farmers Kit, which includes everything needed to setup a greenhouse, crop production and management; and a drip irrigation system for the greenhouse and an additional area of 500m^2, fed by a water tank of 500l capacity.

The company counts on two available sizes. The small is an 8x15m greenhouse, representing a total area of 120m^2, with an effective cultivation area of 56m^2. With optimal growing conditions and proper management it could be possible to get an annual yield of 46kg/m^2, obtaining a maximum annual production of 2,690kg.

The largest is an 8x24m greenhouse, representing a total area of 192m^2, with an effective production area of 92m^2. Under optimal conditions the crop could reach values of 4,416kg per year.

Figure 32. First tomato harvest after greenhouse setup. *(Source: Own elaboration).*

The estimated budget for both cases includes the purchase of the greenhouse, transportation to the center, materials, plants, labor and technical supervision for installation.

Given the climatic conditions of the region and taking into account high adaptability and productivity, crop selected for greenhouse production was tomato.

It is one of the most important vegetable crops in semi-arid regions of Northern Uganda. It is a perennial plant of the family *Solanaceae*, grown as an

annual. It can be grown in creeping, erect or semi-erect way; existing varieties of limited and unlimited growth.

Table 19. SWOT matrix for tomato crop in greenhouse.

STRENGTHS	WEAKNESS
Favorable natural conditions.	Production costs are higher.
Farmers with new technologies reception and adoption abilities.	Operators must have specific knowledge of the activity (advising, training).
High consumption of tomato.	External dependence of inputs.
Yield improvement by surface unit.	
No climatic dependence.	
Integral founding of the infrastructure needed.	
Greater quality. Harvested products are bigger and more uniform.	
Better crop management and pest and disease prevention and control.	
Possibility of more than two harvests per year.	
OPPORTUNITIES	**THREATS**
Be the precursor of this type of production in the area, organizing visits and training to other farmers.	Possibility of a bad use of pesticides and fungicides.
Strong and pronounced regional demand for non-traditional production times.	Target for possible damages or thefts..
Responsible use of irrigation water.	
High nutritional value.	

(Source: Own elaboration).

Cultivation under greenhouses is justified when the open field conditions are not suitable to produce. However, to obtain the highest utility, efficiency in monitoring conditions inside the greenhouse is required.

This could be achieved by proper selection of the location and type of greenhouse. The choice for Glory Special Needs Agricultural Training Center was an 8x15m greenhouse.

The selected location should be the one with lower construction and greenhouse management costs, adding the production costs; to obtain higher yields and good product quality.

The greenhouse, marketed by the company under the brand *´Amiran Farmers Kit´*, consisted on a structure of 15x8m, with a semi-permeable and translucent plastic cover that allowed growing inside along five beds of 13x0.8m, with two lines per bed, under a drip irrigation system.

The kit also included enough material to grow 14 beds, with two lines each, outside the greenhouse under drip irrigation.

The greenhouse was equipped with a 500l capacity water tank, seeds, fertilizers, pesticides and herbicides, enough for the first year, antifungal spray, overalls and face protection. The company offered technical advice during the first year of production, which recommends tomato as the best option to

The first step in the construction of the greenhouse was to locate it within the compound of the school, and further preparation of the ground.

The location was chosen regarding to possible future expansions of the greenhouse.

Once the terrain was cleared it was proceeded to delimitate and pave the ground, in order to start with the foundation of the structural elements. Figure 33 shows the clearing and foundation work processes.

Figure 33. Ground preparation and structure works for greenhouse building. *(Source: Own elaboration).*

During four days the greenhouse installation and the building of a structure to host the water tank irrigation were continued.

By the 22nd of August the infrastructure needed for the intensive production system was built.

Figure 34. Greenhouse building and setup. *(Source: Own elaboration).*

After that day, the company sent an agronomist to analyze the soil quality and explain the guidelines for proper use of both the structure and crop production in greenhouse.

Five double dug beds were setup in order to host the crop. Black soil and manure were added to the ground, made it suitable for the tomato seedlings.

Wooden structures were installed to support the wires would serve to tie the plant stakes.

The drop irrigation line was laid out from the external 500l water tank in two independent splits. First split would irrigate the crop inside the greenhouse, the second one would water the garden located outside the greenhouse.

The tank was placed on a two meters brick structure, to ensure pressure enough to supply water up to the last farthest line´s drip.

The total cost of the greenhouse installation was 9,264,170.10UGsh.

The tomato variety selected was the one suggested by the Balton agronomist, Nemo-netta, an improved Kenyan variety highly tolerant to drought, with a rate of germination of 98%, 100% of purity, big average size and short crop cycle.

Tomato seeds were planted in a nursery bed. After 30 days, the seedlings were transplanted by the pilot group into the greenhouse. (See Annex V. Crop manual).

Irrigation measures suggested by the Balton agronomist were to water twice per day, with 15 minutes watering each time during rainy season, and twice per day, with 30 minutes watering each time, during dry season.

2.3.2 GARDEN SETUP

The existence of a school garden, set up by the students of the school, and the good results obtained made it necessary to take this initiative to enhance both production levels of crops, and the educative and training possibilities it offers, and use the garden as learning platform.

From an educational innovation perspective, the school garden suppose an important educational resource, since it allows to implement an active and cooperative learning based on the planned problem solving as well as an effective development of attitudes and values.

Thus, the role of the school garden is to be educational and entertaining, conceived as a voluntary activity that focuses on students who really are interested.

The educational element of the school garden has to have a strong practical and group component, as it is the best way to assimilate and develop skills in planning, problem solving and prevention implications; at the same time as the initiative and responsibility, teamwork and relationships with people from the immediate environment are enhanced.

The availability of pipeline to irrigate an extra surface of 500m^2 in the Amiran Farmers Kit supposed an opportunity to improve both, the productive and educative capability of the Centre.

Activities in the school garden were resumed, with the collaboration of Glory Special Needs Primary School boarding pupils.

The parcel intended for the garden was a piece of land inside the school compound of 28x14m, making a total surface of 392m^2 (See Document 2. Plans).

By the end of September, the garden ground was set. The parcel was arranged in 40 double dug beds of 80x600cm. Each bed was irrigated by two drip lines, as could be seen in Figure 35.

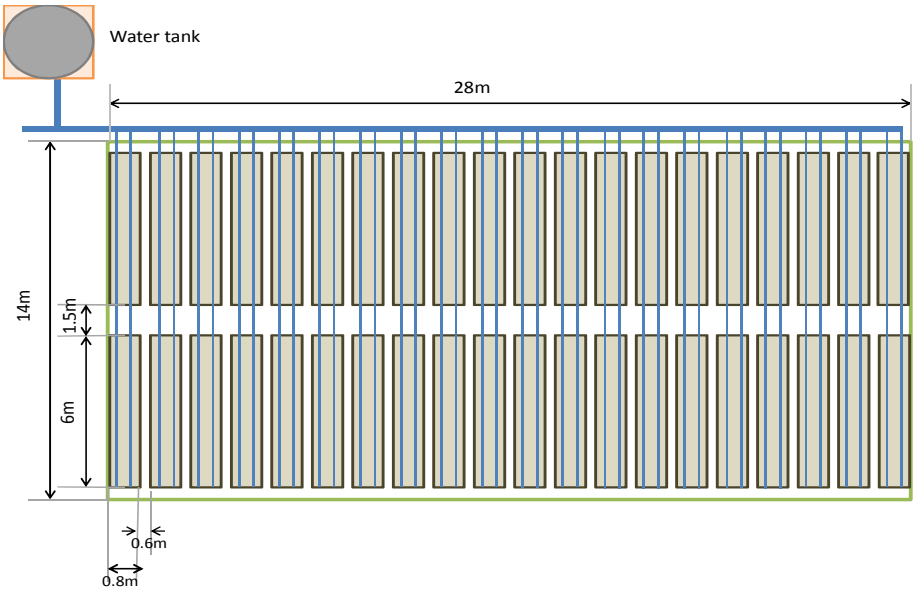

Figure 35. School garden disposition. *(Source: Own elaboration).*

To set the double dug bed, the whole parcel was excavated and manure and rice husk were added, to improve the quality of the soil.

The election of irrigate the garden with drip watering lines allowed to use the resource in a more sustainable way. The advantage presented by the system are:

- No runoff occurs. Losses by percolation and evaporation are almost null.
- No power requirements. System is powered by gravity.
- Water supply at the right spot.
- Optimal and efficient use of fertilizers along with irrigation water (if need).
- Significant reduction of weeds in crops.
- Is usable and adaptable to any topography.
- Reducing the problems of erosion and damage to soil structure.

This system requires a periodical check of every single drip, due to obturation problems, and a good maintenance of the line filters.

The alternatives in local market seed warehouses did not allow choosing the best variety amongst several options, so the election was restricted to the varieties shown in Table 20.

Table 20. Available vegetable crops in Kitgum seed warehouse.

Crop	Yield (Kg/Ha)	CropCycle (days)	Droughttolerance
Eggplant (Blackbeauty)	9,500	100-110	MEDIUM
Green pepper (Yolo wonder)	11,200	110-120	HIGH
Carrot (Nantes)	10,800	70-110	HIGH
Cabbage (Gloria)	13,500	90-100	HIGH

(Source: Own elaboration).

The management of the different beds was oriented to follow a crop rotation pattern, for not to exhaust the soil.

The pattern was designed considering the four main crops to produce and one extra crop, cowpea (*Vigna unguiculata)*, used as green manure. The proposed rotation was pepper, carrot, eggplant, cabbage and cowpeas. Thereby, the garden was distributed as follow.

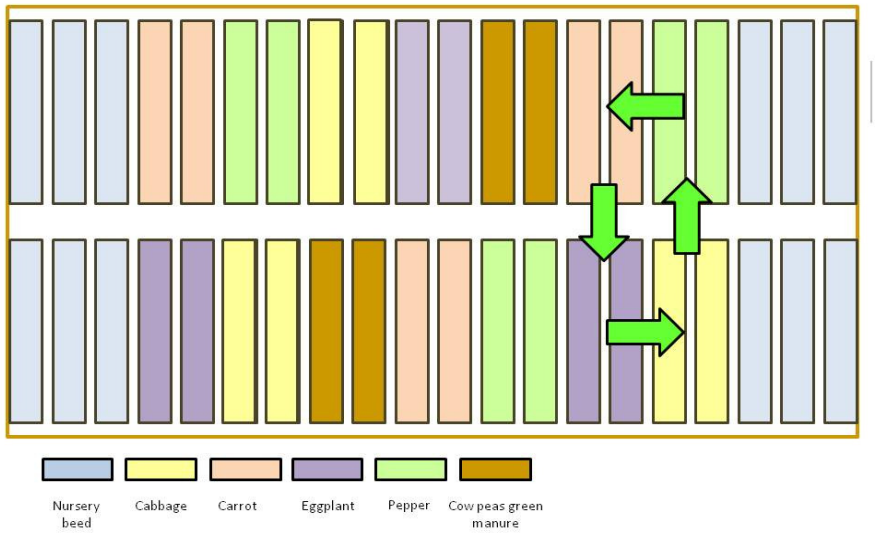

Figure 36. Vegetable crop rotation. *(Source: Own elaboration).*

The beds were divided in modules in order to facilitate the understanding, by a more visual way, of the benefits of crop rotation. Each module, composed by eight beds, was used only by one group as learning unit.

The module remaining was used by the pupils of Glory Special Needs Primary School, as school garden.

It was expected to increase the crops average yields from 20 to 40% by the first season, and by using good agricultural practices and water use through drip irrigation, in a sustainable way.

The productive surface of each bed is 4.8m^2. Six beds were allocated for each crop, making a total productive surface per crop of 28.8m^2. The harvested production for each crop is shown in Table 21.

The expected production was calculated with the average yields provided by the seeds supplier.

Table 21. Vegetables production in Glory Special Needs Agricultural Training Center

Crop	Plantig frame (cm)	Yield (Kg/m^2)	Expected production (Kg)	Harvest (Kg)
Eggplant	80 x 45	6.5	187.2	243.4
Green pepper	80 x 45	4.7	135.4	175.9
Carrot	15 x 20	3.8	109.4	142.3
Cabbage	70 x 40	5.6	161.3	209.7

(Source: Own elaboration).

The yield and harvest of cowpea is not considered in this table because the production was used as green manure, added to the soil after harvested. The beans were used to feed the poultry in the school.

Figure 37. Garden beds preparation and firsts harvests (pepper and cabbages). ***(****Source: Own elaboration).*

No chemical inputs were used in the production of these crops. All the compost used to improve the soil fertility was produced in the Centre, by the pupils, as part of the training program.

The compost was made by the outputs from the kitchen of the school (ashes and organic rubbish), chopped grass collected from the nearby areas, poultry drops from the chickens in the school, black soil and water.

For pest and diseases prevention, crops were treated with liquid extraction made by neem tree *(Azadirachta indica)* leaves, plentiful in the area.

This neem tree oil has well known antifungal and insecticide properties. Its active ingredient is azadiractine, which is innocuous to human beings, but effective against *Puccionomycetes, Erysiphales, Botyotinia,* and several insects as filoxera, plant louse or weevils. It does not affect to beneficial insects.

Neem oil could be used as contact insecticide, applied directly on the plants, or as systemic insecticide, when is absorbed by the roots.

The treatment with neem oil was applied sprayed on the leaves as antifungal, and incorporated in the irrigation water, as insecticide.

The use of manure, good and sustainable farming practices as, bed preparation, weeding, pest control, along with the drip irrigation system set up, meant an average yield increase of 30% on the average yields given by seeds suppliers.

2.3.3 RAINFALL HARVESTING POOL

To satisfy the water needs of the intensive production system, study was performed. Taking into account the rains patterns during a normal bimodal year, and applying a safety coefficient to avoid floods, it was determined that the total crops water demand could be satisfied with a pool of $40m^3$ (See Annex IV. Calculations). The dimensions of the pool were overestimated in $9m^3$ to prevent possible floods and/or keeping an extra reserve for drier years (bimodal-unimodal alternation).

To build the pool, a third party construction company, *Dano pa Dano* constructors, was hired. Construction materials were bought by NUCBACD, with the funds of the present project. The third party contributed with labour, calculations and plan designing.

The location of the tank was made according to save money in pipelines meters from the pool to the irrigation tank, expensive and not available in Kitgum market. The chosen place was besides the office (See Document 2. Plans).

As could be seen in Figure 38, the facility consisted in a 4x2.5x4m pit for collecting the raining water during the wet season.

To build the pool it was necessary to excavate a 5.9x3.4x4.5m pit. It was done manually by three workers, with hoes, picks and shovels. Soil moving and ground preparation works took one week.

The perimeter was fulfilled with hardcore, to avoid sand collapse and serve as support to settle the concrete. It was also reinforced with a ring beam to keep the stability of the structure. Every surface was cover with waterproof cement.

Figure 38. Rainfall harvesting pool. *(Source: Dano pa dano constructors and own elaboration).*

The pool was covered by an iron plate with two holes –one for the feeding pipe, the other for the pumping pipe- in order to prevent accidental falls, pipe obstructions due to foreign objects, and surface water evaporation.

To feed the pool it was the next step for finalising the infrastructure needed for the intensive production system.

For this purpose, and to ensure an adequate supply to the pool, the roofs of classroom block A and the office were connected through a gutter system flowing into a 12inches pipe that feeds the pool.

The total catchment area was 358.9m^2. 94.3m^2 belongs to the office, and 264.6m^2 belongs to the classroom block A; which gave a maximum harvesting peak of 31m^3 during the wettest month, October (See Annex IV. Calculations).

To collect the rainfall, 72m of 5” aluminium gutters were set up. To connect both buildings and feed the pool, 29.3m of 3” PCV pipeline were installed.

Figure 38 shows and sketch of water pool feeding installation, were gutters could be appreciated in orange, and the connecting and feeding pipeline in green.

To facilitate a continuous flow of water in both the gutters and pipes, they were installed considering a 2% of slope.

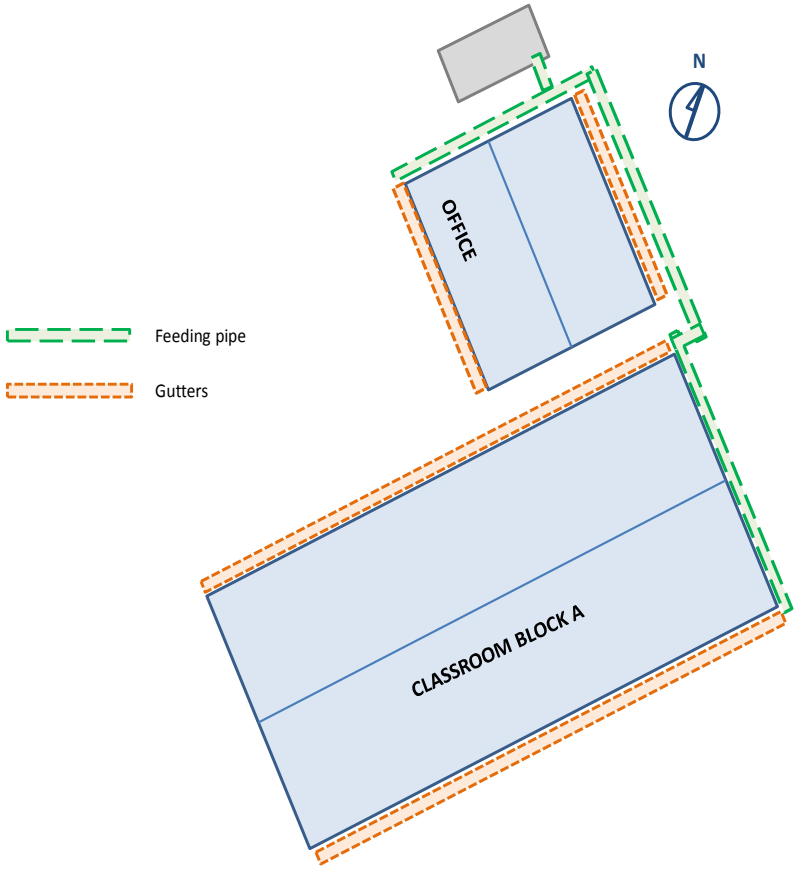

Figure 39. Water pool feeding system installation sketch. *(Source: Own elaboration).*

To pump the water from the pool to the tank, the Centre invested in the purchase of a treadle pump, which could also be used as sprinkler. To connect the pool with the pump and from here to the irrigation tank, 66m of hose line were bought.

With the installation of the pump, the infrastructure was finalised, thereby the intensive production system was able to start its activities in mid-October.

The total amount spent in the construction of the rainfall harvesting pool and feeding system was 10,552,813.50UGsh.

2.4 TRAINING PROGRAM

The Centre should be able to provide instruction to all those admitted, in line with the integrative mind set of NUCBACD, providing both, disabled and non-disabled, the same opportunities.

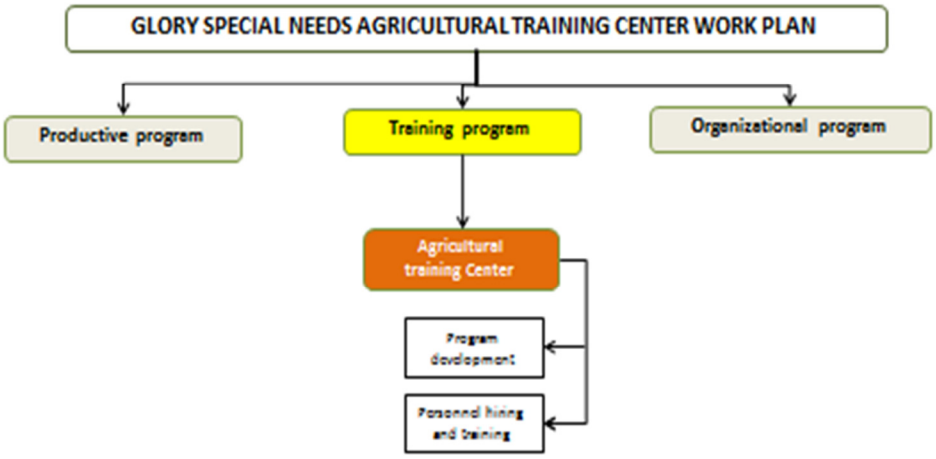

Figure 40. Training program in the Operative plan designed to the Agricultural Training Center. *(Source: Own elaboration).*

The importance of developing a quality educative program was essential for the success of Glory Special Needs Agricultural Training Centre. The developed program was named '*Certificate in General Agriculture'*, with a length of eight months, divided in two semesters.

The program was approved by the District Education Officer, O.H. Torach, and signed as official certificate in vocational education.

The syllabus was organized in two blocks of five subjects each one. The subjects to teach during the first semester will be: *Principles of Agriculture*, *Soils science, Annual crops, Farm planning* and *Farm practices I.*

During the second semester*, Home economics, Horticulture, Crop protection, Sustainable Agriculture Development* and *Farm practices II* will be taught.

The full syllabus could be consulted in Annex VI. Syllabus, in the present document.

The Centre will count with four teachers and one project coordinator, who will take the responsibility of Head teacher. The Centre will also count with two sign language interpreters.

The staff and subjects taught by each one were:

- P. Obora (Agricultural Project Coordinator/Head teacher): *Farm planning* and *Home economics.*
- A. Lagudy (Teacher): *Principles of Agriculture* and *Sustainable Agriculture Development.*
- R. Okema (Teacher): *Annual crops* and *Horticulture.*
- F. Ociti (Teacher): *Soil science* and *Crop protection.*

- A. Omonyi (Teacher): *Farm Practices I* and *II.*
- H. Akello (Interpreter).
- R. Okello (Interpreter).

2.4.1. CERTIFICATE IN GENERAL AGRICULTURE PROGRAM REGULATIONS

The general objective of the program is to provide general agricultural skills to the youth at an early stage so as to promote self-employment and thus reduce unemployment; but also to all those farmers interested on improve their abilities to eradicate poverty from their households.

As specific objectives, the program shall enable the stakeholders to:

- Acquire a strong background in agriculture.
- Participate effectively at grass-root level in agricultural modernization programs.
- Perform as competent and effective agricultural change agents in the community in which they live.
- Become creative and innovative in the process of analysing, interpreting and finding solutions to problems in the field.
- Be practical, as them will have acquired a broad spectrum of skills related to crop production.

The admission requirements were set in accordance to the Centre policy and the NUCBACD regulations.

A candidate shall be eligible for admission to the Certificate program if they hold the Uganda Certificate of Education or its equivalent.

The course content is divided into ten courses, each of which has been designed to cover an aspect of the training.

Instruction shall be by courses quantified in credit units. A credit value shall be equivalent to a series of ten learning hours (lecture, tutorial or practical).

The semester course load a student will be allowed to take is a minimum of 15 credit units and a maximum of 23 credit units. All courses shall be scored.

Each course should be assessed on the basis of 100 total marks with 20% in written, 30% in progressive assessment and 50% in practical.

Progressive assessment of the candidate shall be based on his/her performance in the practical work, test and assignments.

Each course should be graded according to the computed marks obtained from both the continuous assessment and examination. The graded of Certificate awarded to a student should be according to the cumulated grade point average (CGPA).

Each course should be graded out of a maximum of 100 marks and assigned appropriate letter grades and grade point average as follows:

A: 5; B+: 4.5; B: 4; B-: 3.5; C+: 3; C: 2; C-: 2.5; D+: 1.5; D: 1; D-: 0.5.

The final marks for a module should be converted into Grade Points (GP) as follows:

Table 22. Conversion rate from marks to GP

	CERTIFICATE IN GENERAL AGRICULTURE MARKS									
Marks	80-100	75-79	70-74	65-69	60-64	55-50	55-59	50-54	45-49	40-44
GP	5	4.5	4	3.5	3	2.5	2	1.5	1	0

(Source: Own elaboration).

The pass mark for any course is 50%, equivalent to GP of 2.0.

The computation of grade points average and cumulative GPA shall be calculated using the following formula:

$$GPA = \frac{\sum_{i=1}^{n}(\mathrm{GPi} \times \mathrm{CUi})}{\sum_{i=1}^{n} CUi}$$

Where GP_i is the grade point scored in course i; CU_i is the number of credit units of course i; and n is the number of courses taken in that semester.

CGPA is calculated using a formula similar to the one above, but n is the number of course taken from the beginning of the program, up to the time when the CGPA is being.

Any candidate whose attendance at prescribed lectures, practical classes or seminars has been unsatisfactory or has failed to submit exercises or to take tests or class examinations may be denied the certificate of due performance.

A student should be required to discontinue his/her studies if the candidate fails the same course unit three times or attains a CGPA of less than 2.0 on three consecutive times.

A candidate who fails more than two courses in a given semester will be required to stay put to clear the retakes before progressing to the next semester.

The program shall be a part time undertaking and shall last a total of two semesters, equivalent to one academic year. A semester shall be 14 weeks, with 13 weeks being for learning and one week for examinations.

Upon completion of the program of study to the satisfaction of the Centre board, a candidate shall be awarded with the Certificate in General Agriculture of Glory Special Needs Agricultural Training Centre.

2.4.2 PILOT GROUP

For implementing the program in the most effective way and outline its syllabus, a trial was carried out with a pilot group composed by eight students, four of them from the CARE project of NUCBACD, four coming from the last course of Glory Special Needs Primary School.

The pilot group was divided in two, formed by two disabled and two non-disabled students, between 17 and 20 years old. The chosen candidates, seven boys and one girl, were volunteers who offered to participate in the program.

The groups were leaded by A. Omonyi and D. del Olmo, and supported by H. Akello and R. Okello as sign language interpreters.

The pilot group was formed in mid-September and started its activities in October, according to the first draft of the syllabus designed by the board of teachers and D. del Olmo as advisor and link with external parties, like local government and farmers associations.

The activities of the two working groups were carried out twice per week, alternating groups by day, in order to develop the subjects' content according to the observed needs and trying to apply it during the performance of the activities. Each working day consisted on two sessions, one theoretical of two hours, and other practical, of four hours.

The groups were trained in the following summarized topics, from October 2011 to February 2012:

- Principles of Agriculture.

- Land management and soil science.
- Annual and perennial crops: Beans, millet, sesame, rice, maize, cassava and tubers.
- Horticulture.
- Home economics.
- Crop protection.
- Sustainability.

Figure 41. Students of the pilot group with a keyhole garden made by them as part of the training, and theoretical session in annual crops. *(Source: Own elaboration).*

Most of the topics were treated from practice and in a participative way, in order to make the training easier to them.

To assist the integration of deaf students, apart from the assessment and support of the interpreters, a communicative environment was created. NUCBACD central headquarter enhanced this initiative with three workshops to the pupils enrolled in the program. All the workshops were carried out in Glory Special Needs Agricultural Training Centre.

The first workshop was about communication and teambuilding, second one was about improving the communicative barriers, and the last one was about psychosocial intervention.

The training was completed with two training sessions in KDFA fields guided by P. Orila, Agricultural Extension Officer in Gulu.

2.5 ORGANIZATIONAL PROGRAM

To achieve the proposed objectives and ensure a proper running of the Center; it was needed to recruit some professionals with specific profiles, and define the roles and responsibilities of each member of the staff.

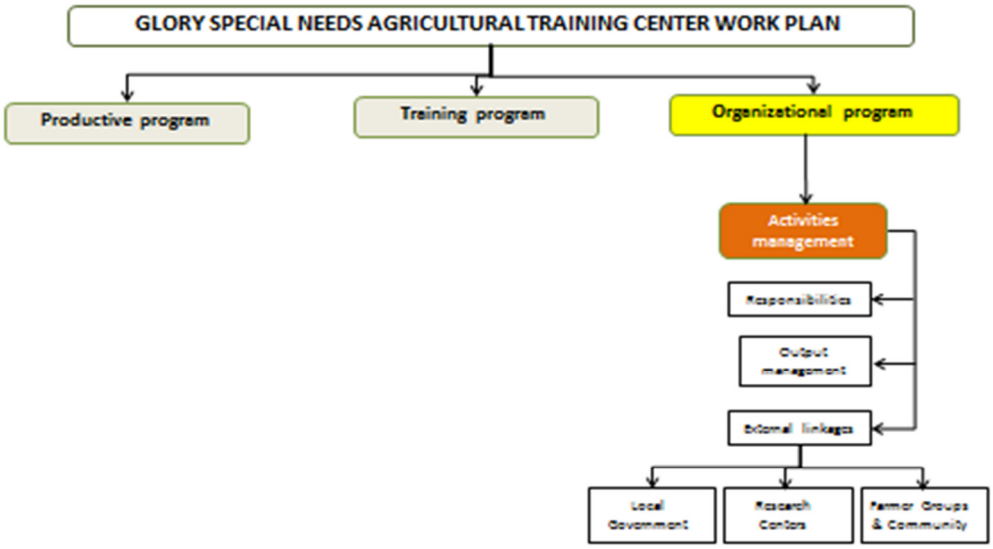

Figure 42. Organizational program in the Operative plan for the Agricultural Training Center. *(Source: Own elaboration).*

The following sections describe the responsibilities, roles, profiles, contract forms and other related issues that are interesting when to build a capable team to face and take forward the Agricultural Training Center.

2.5.1 ORGANIZATION CHART

The person in charge of the administrative management of the Centre will be T. Ayoo, director of NUCBACD and Glory Special needs Primary School. She will be the last responsible of the Centre policy and administration, including the management of the crops outputs. She will be accountant of the Agricultural training program.

The coordinator of the program will be P. Obora, acting as head teacher of the Centre. He will be responsible of the Agricultural Program performance, leading the teachers in the syllabus development process. He should be accountant of the previous stage -the implementation stage- .

His main role is coordinating the teachers and interpreters, ensuring that the Centre policy, especially in integration matter, is complied. He also has to be the link between the Agricultural Training Centre and NUCBACD director board, reporting of the program performance and escalating, if need, any problem could occur.

A. Omonyi, A. Lagudy, R. Okema and F. Ociti will be the teachers of the Centre. They should guide the students in both educative and integrative ways in order to achieve the objectives defined. Their task will be supported and enhanced by the work of H. Akello and R. Okello, appointed as sign language interpreters.

Thus, the organizational chart of Glory Special Needs Agricultural Training Centre looks as follows:

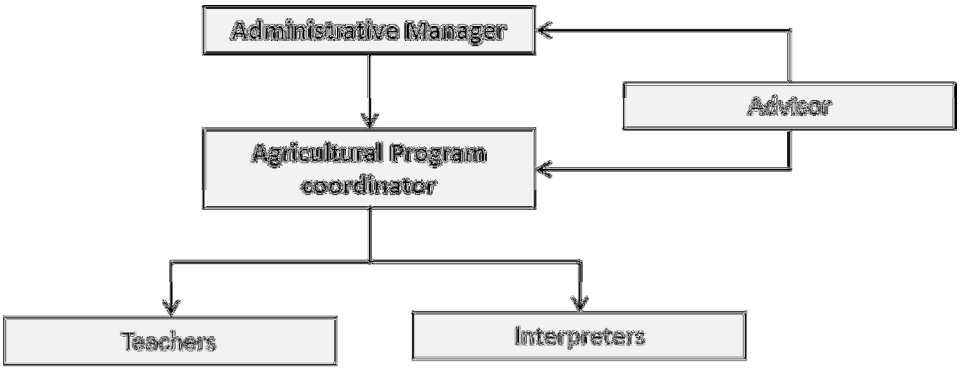

Figure 43. Glory Special Needs Agricultural Training Center's organizational chart. *(Source: Own elaboration).*

2.5.2 JOB DESCRIPTION AND PROFILES

The total number of salaried employees under the Agricultural program was seven. Each employee had different functions and responsibilities, and each profile depended on the performed job.

Administrative manager tasks and responsibilities:

- NUCBACD and Glory Special Needs Primary School director. Administrative director of Glory Special Needs Agricultural Training Centre.
- Crop outputs management.
- To purchase management of seeds, farming inputs, materials and all those items needed in the normal running of the Centre.
- Budget expenditure and approval.
- To guarantee the normal running of the Centre and control the Centre policy compliance.
- To keep and promote the Centre image.
- To establish and develop promotion policy of the Centre.
- To represent the Centre in official acts and other events where need.
- To aware the society in terms of disability and integration.
- To build up the links with local government and research centres.

Agricultural program coordinator tasks and responsibilities:

- To manage, motivate, supervise and evaluate periodically the agricultural program staff.
- To study the performance of the program to improved it according to the reality of the community.
- To coordinate the syllabus development.
- To analyse the local market to program a market oriented agriculture.
- To promote Agriculture amongst the young population.
- To have a deep knowledge of the local agricultural systems of the region.
- To have a clear and open mind in terms of social integration and be able to transfer it to the students.
- To be able to form part of a continuous improvement loop, guided to offer the best service to the Centre and the community.
- Keep and improved the links with agricultural research centres.

Job profile:

- Tertiary studies in Agriculture.
- Great motivation and interest in the job vacancy.
- Decision making and risk assuming abilities.
- Creativity, dynamism, communication, leadership and team working skills.

NUCBACD decided to hire P. Obora, former District Agricultural Officer and retired teacher.

Teacher tasks and responsibilities:

- To translate the syllabus into the reality of the field.
- To work with big groups of people.
- To teach and develop its subject according to the Centre requirements and policy.

Job profile:

- Vocational training in Agriculture and deep knowledge of local systems.
- Willingness to teach and learn.
- Good communication skills, patience and creativity.

The above mentioned teachers were hired from NUCBACD, on recommendation of AVSI, Italian NGO working in Kitgum in several agricultural projects, after their satisfactory completion of AVSI's capability program for extension advisors.

Interpreter tasks and responsibilities:

- To translate into sign language the lessons for the deaf students.
- To teach sign language to teachers and interested students.

Job profile:

- Have a deep knowledge in Ugandan sign languages.
- Ease of communication.

H. Akello and R. Okello were working for Glory Special Needs Primary Schools and suggested by T. Ayoo for the performance of this job.

2.5.3 PERSONAL COST

The cost of the personal of the Agricultural Training Centre was cover by the project budget, during the first year. It will be split in 12 wages, covering one month of holidays.

Table 23. Glory Special Needs Agricultural Training Center Personal costs

Labour	Hired	Wage (UGsh/month)	Wage number	Annual salary/person (UGsh)
Program coordinator	1	250,000	12	3,000,000
Teachers	4	200,000	12	2,400,000
Interpreters	2	150,000	12	1,800,000
Total				**16,200,000**

(Source: Own elaboration).

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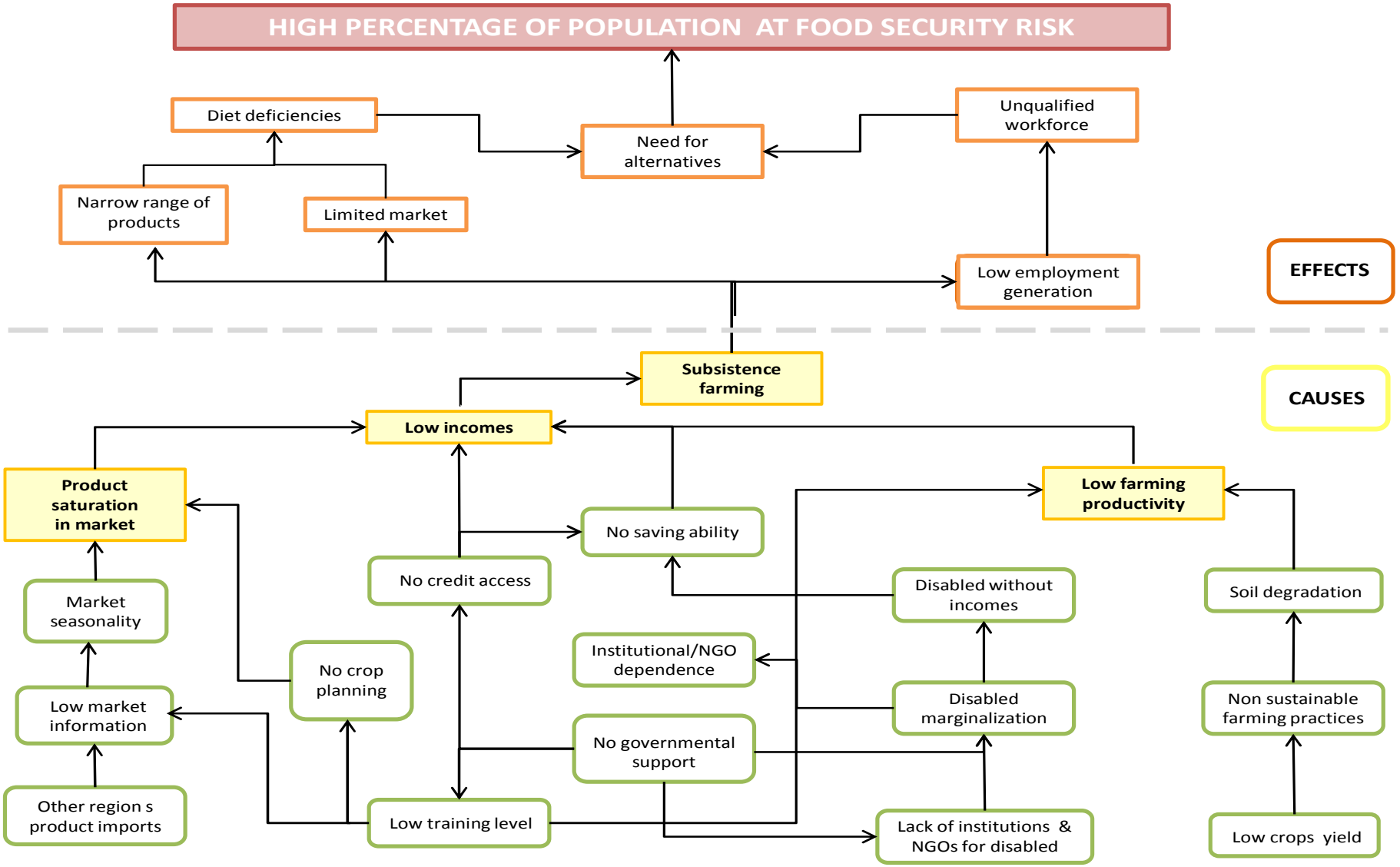
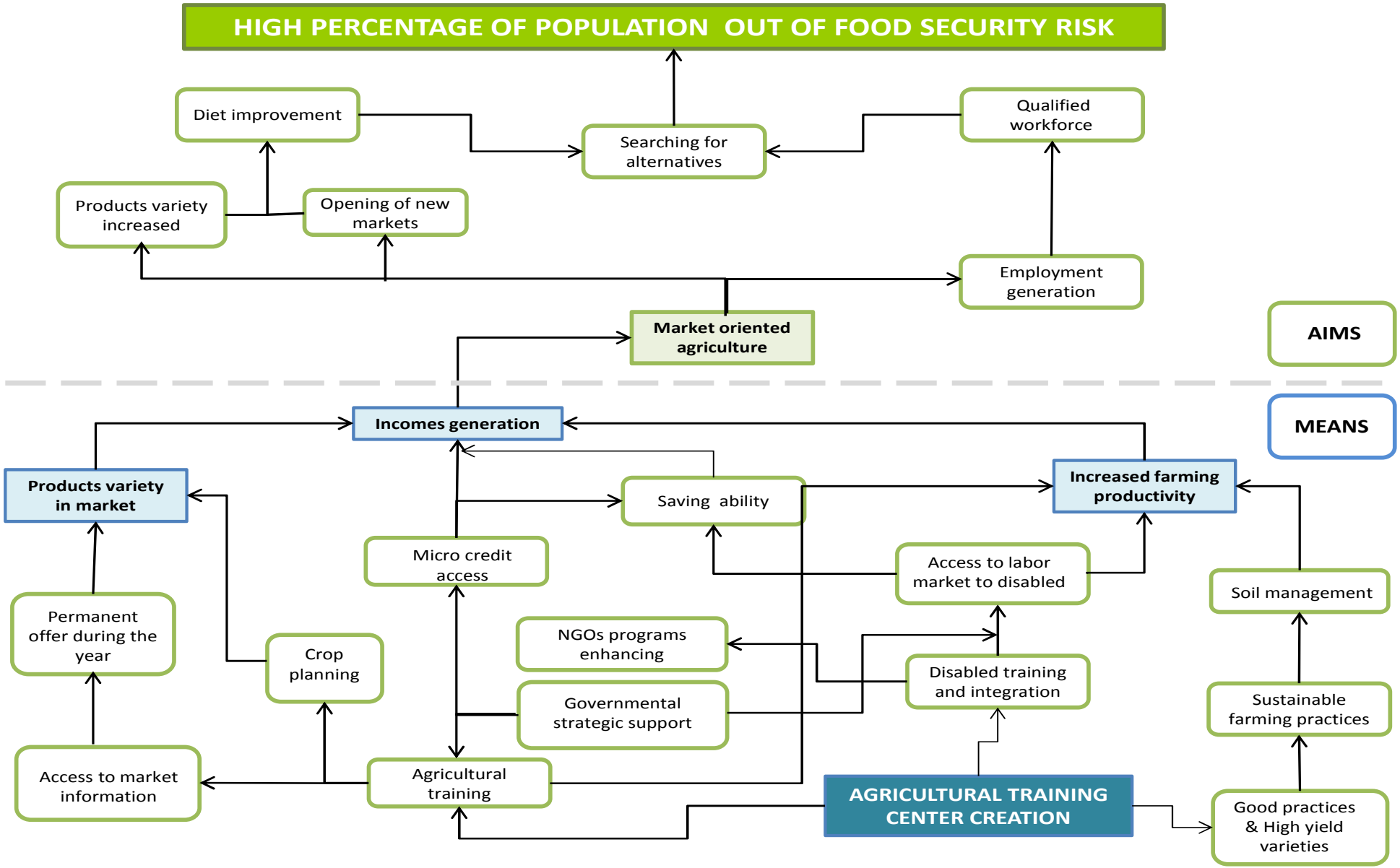
ANNEXES

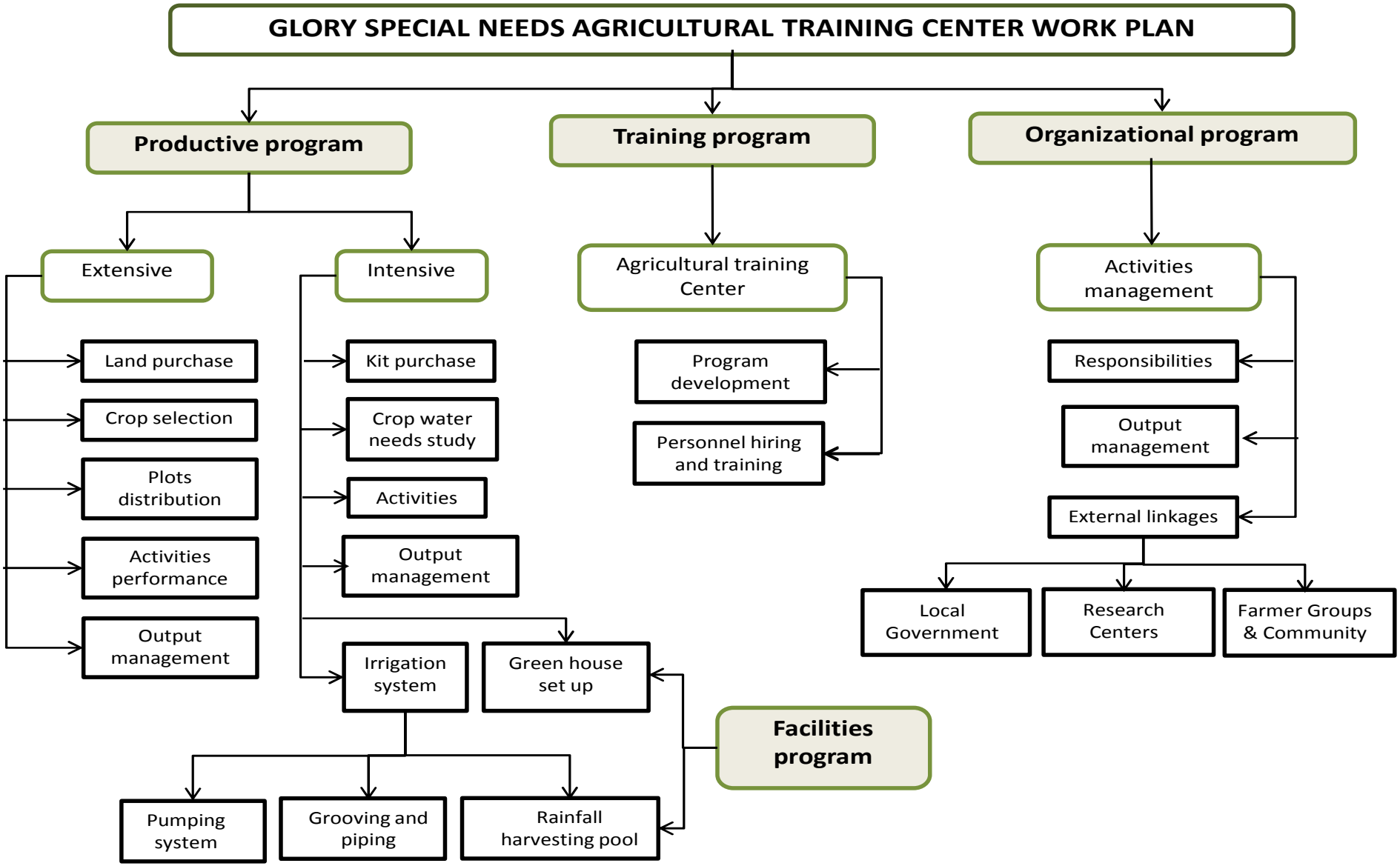
ANNEX I. PROBLEMS TREE


HIGH PERCENTAGE OF POPULATION AT FOOD SECURITY RISK
Diet deficiencies
Need for alternatives
Unqualified workforce
Narrow range of products
Limited market
Low employment generation
EFFECTS
Subsistence farming
CAUSES
Low incomes
Product saturation in market
Low farming productivity
No saving ability
No credit access
Disabled without incomes
Soil degradation
Market seasonality
Institutional/NGO dependence
No crop planning
Disabled marginalization
Non sustainable farming practices
Low market information
No governmental support
Other region s product imports
Low training level
Lack of institutions & NGOs for disabled
Low crops yield

ANNEX II. TARGETS TREE


HIGH PERCENTAGE OF POPULATION OUT OF FOOD SECURITY RISK
Diet improvement
Searching for alternatives
Qualified workforce
Products variety increased
Opening of new markets
Employment generation
Market oriented agriculture
AIMS
MEANS
Incomes generation
Products variety in market
Saving ability
Increased farming productivity
Micro credit access
Access to labor market to disabled
Soil management
Permanent offer during the year
NGOs programs enhancing
Crop planning
Disabled training and integration
Governmental strategic support
Sustainable farming practices
Access to market information
Agricultural training
AGRICULTURAL TRAINING CENTER CREATION
Good practices & High yield varieties

ANNEX III. OPERATIVE PLAN


GLORY SPECIAL NEEDS AGRICULTURAL TRAINING CENTER WORK PLAN
Productive program
Training program
Organizational program
Extensive
Intensive
Agricultural training Center
Activities management
Land purchase
Crop selection
Plots distribution
Activities performance
Output management
Kit purchase
Crop water needs study
Activities
Output management
Program development
Personnel hiring and training
Responsibilities
Output management
External linkages
Local Government
Research Centers
Farmer Groups & Community
Irrigation system
Green house set up
Facilities program
Pumping system
Grooving and piping
Rainfall harvesting pool

ANNEX IV. CALCULATIONS

The following calculations were made to measure the water tank capacity according the available capitation surface and the rainfall average. Meteorological data was collected from Kitgum Meteorological Station.

KNOWN VARIABLES		
Water Demand	*liters per day*	300.00
Dry Season Duration	*months*	3.5
Roof Length	*meters*	11,50
Roof Width (full)	*meters*	8.20
Catchment Area	*square meters*	94.3

TANK PARAMETERS		
Length	*meters*	2.5
Width	*meters*	4
Depth	*meters*	4
Total Volume	*cubic meters*	**40**

SEASONAL DEMAND		
Dry Season Demand	liters	31,500
*= Water Demand * 30 days/month*Dry Season Duration*		
Dry Season Demand	cubic meters	31.5
= Dry season demand/1000 liters/cubic meter		

Month	Rainfall (mm)	Water Harvest (m^3)**	Amount of Water in Tank (m^3)***
January	23,49	2,2154606	**18,30**
February	19,61	1,8494588	**11,15**
March	81,45	7,680735	**9,83**
April	**147,08**	**13,869762**	**13,87**
May	139,37	13,142473	**18,01**
June	135,86	12,811244	**21,82**
July	130,53	12,309097	**25,13**
August	150,45	14,187435	**30,32**
September	127,97	12,067453	**31,00**
October	149,03	14,053058	**31,00**
November	93,31	8,7993688	**30,80**
December	34,81	3,2828188	**25,08**

*** = rainfall /1000 mm/m* catchment area*

**** calculated by starting water accumulation in April while accounting for tank volume and water usage*

year	parameter	unit of measurement	month													
			Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	TOTAL	Monthly Mean
1995	rainfall	mm	0,3	1,9	71,3	177,3	134,1	71,1	184,1	196,9	108,9	159,2	95	47,9	1248,00	104,00
	max temp	degrees celcius	34,8	34,1	33,8	32,2	31,5	30,6	29	30,2	30,1	29,9	30,7	30	NA	31,41
	min temp	degrees celcius	14,4	16,1	18,2	18,2	16,9	16,6	16,5	16,1	15,5	15,6	15,1	13	NA	16,02
1996	rainfall	mm	32,9	18,8	66,1	181,4	169,9	177,7	89,2	131,8	122,8	121,7	53,2	20,4	1185,90	98,83
	max temp	degrees celcius	32,5	34	33,1	31,1	30,6	29,2	29	29,7	30,3	31,8	31	33,8	NA	31,34
	min temp	degrees celcius	13,5	15,2	16,3	15,6	16	15,5	14,4	14,3	13,8	13,1	13,1	12,4	NA	14,43
1997	rainfall	mm	12,7		91,2	218,6	107,9	103,2	96,8	155,3	21,8	155,6	239,2	72,8	1275,10	106,26
	max temp	degrees celcius	34,3	39	37	30,1	30,5	30,8	29,7	30,7	34,2	13,8	29,6	30,4	NA	30,84
	min temp	degrees celcius	12,1	15,3	15,3	15	13,9	13,6	13,3	13,2	11,8	13,6	13,7	12,4	NA	13,60
1998	rainfall	mm	66,5	7,6	9,6	152	144,5	199,9	177,3	242,5	157,9	198,9	62,6	5,5	1424,80	118,73
	max temp	degrees celcius	31,7	34,9	36,5	33,1	31,6	30,3	28,7	29,9	30,7	30	31,9	34,5	NA	31,98
	min temp	degrees celcius	12,6	13	14,7	15,2	14,5	13,7	12,9	12,8	12,3	12,5	10,9		NA	12,09
1999	rainfall	mm	0,6	5,2	108,3	228,9	117,4	81,9	198,9	198,4	119,5	231,5	45	39,7	1375,30	114,61
	max temp	degrees celcius	34,5	36,7	31,7	30,6	30,8	30,5	29,5	28,9	31	30	31,8	33,1	NA	31,59
	min temp	degrees celcius	15,2	17,7	19,9	19,1	18,9	18,6	18,1	17,8	17,9	18,6	17,7	16,8	NA	18,03
2000	rainfall	mm	18,3	3,2	23,9	96	152,6	175,4	51	143,3	121	160,4	60,5	7,7	1013,30	84,44
	max temp	degrees celcius	35,2	37,3	34,2	33,6	31,7	30,8	28,8	29,8	13,2	30,4	31,2	33,1	NA	30,78
	min temp	degrees celcius	16,3	18,3	18,7	20,2	19,4	19,1	18	18,6	18,1	18,4	17,5	16,4	NA	18,25
2001	rainfall	mm	6,1	5,3	162,8	115,5	115,1	82,9	186,6	140,6	68,9	214,3	107,5	2,7	1208,30	100,69
	max temp	degrees celcius	33,4	35,6	33,2	30,9	31,3	36	30,1	30	30,9	31	30,7	33,6	NA	32,23
	min temp	degrees celcius	16	18	19,3	19,1	19,2	18,5	18,2	18,7	17,9	18	18,4	16,6	NA	18,16
2002	rainfall	mm	37,8	0,5	143,3	83,8	132,5	226,4	73,9	130,1	106,1	165,5	199,2	73,6	1372,70	114,39
	max temp	degrees celcius	33,4	36,5	31,9	32,2	30,7	30,5	31,2	30,6	31,8	31,3	30,8	31,3	NA	31,85
	min temp	degrees celcius	17,2	17,9	19,7	19,3	19	18,8	19,1	18,7	17,6	18,5	17,9	16,8	NA	18,38
2003	rainfall	mm	25	9,8	84,1	176,8	148,8	131,9	166,2	158,3	74,5	66,9	58,3	37,8	1138,40	94,87
	max temp	degrees celcius	34	36,1	34,4	32,4	30,6	30,3	29,7	29,5	31,5	32,5	32,8	33,4	NA	32,27
	min temp	degrees celcius	17	18,2	19,6	19,6	19,5	19,2	19,2	18,2	18	18,6	18,5		NA	17,13
2004	rainfall	mm	44,5	13,3	35,5	236,4	92,8	163,2	83,2	137	81,4	81,3	149,5	16,8	1134,90	94,58
	max temp	degrees celcius	34,2	35,2	36,4	13,4	32	31,8	31	30,2	30,8	32,2	30,8	25,8	NA	30,32
	min temp	degrees celcius	18,6	16,8	19,4	20,1	18,7	18,6	18,4	18,7	18,7	18,4	18,1		NA	17,04
2005	humidity	%	63	60	72	71	81	79	83	83	79	79	65	45	NA	71,67
	rainfall	mm	24,7	26,7	97,6	100,3	124,2	83,3	104,8	111,8	148,1	70,4	58,8	0	950,70	79,23
	max temp	degrees celcius	34,4	36,1	33,4	34,1	31	31,7	31	31,1	32,2	33,6	33,6	36,2	NA	33,20
	min temp	degrees celcius	16,6	18,6	18,9	19,3	19,5	19,1	18,8	18,7	18,2	18,5	17,9	17,3	NA	18,45
	windrun	km	92,5	135,92	105,92	110,26	75,17	71,85	79,28	72,06	75,46	79,65	99,44	124,88	NA	93,53
2006	humidity	%	53	57	73	80	83	80	87	85	78	78	88	82	NA	77,00
	rainfall	mm	7,4	13,4	91,9	158,2	185,8	59,5	176,1	69,8	128,1	142,1	174	122,7	1329,00	110,75
	max temp	degrees celcius	35,6	35,6	32,7	32	32,1	31,5	30,3	30,3	32,8	31,1	29,5	30,1	NA	31,97
	min temp	degrees celcius	17,8	17,9	18,7	19,5	18,6	18,8	16,8	18,6	18,2	18,2	17,1	16,1	NA	18,03
	windrun	km	147,8	138,3	88,5	88,2	71,9	72,9	68,1	75,5	78,7	91,6	62,7	40,2	NA	85,37

2007	humidity	%	69	73	67	69	78	86	90	85	86	77	72	63	NA	76,25
	rainfall	mm	44,6	57	68	83,7	115,1	185,1	190,8	140,4	235,7	59,1	32,3	37,8	1249,60	104,13
	max temp	degrees celcius	32,4	33	33,5	33,4	31,5	29,6	29,3	30,7	29,9	31,7	32,4	33,2	NA	31,72
	min temp	degrees celcius	16,7	18	18,3	19,1	18,8	18,5	18,4	18,6	18,2	17,6	16,9	15,8	NA	17,91
	windrun	km	46,3	37,9	38,1	37,8	12,7	6,2			60,6	63,9	74,9	67,7	NA	44,61
2008	humidity	%	63	67	74	81	82	79	87	85	84	83	69	54	NA	75,67
	rainfall	mm	20	7	125,2	164,7	121,6	144	107,3	144,2	134,7	260,9	82,2	0	1311,80	109,32
	max temp	degrees celcius	34,1	34,9	32,9	31,1	31,5	30,6	28,9	29,8	30,6	30,3	31,7	34,5	NA	28,90
	min temp	degrees celcius	17,3	18,2	19	18,4	18,2	18,4	17,8	18,2	18,1	17,5	15,8	14,6	NA	17,63
	windrun	km													NA	0,00
2009	humidity	%	57	59	61	54	78	77	82	81	82	76	77	77	NA	71,75
	rainfall	mm	26,7	5,2	47,4	139,9	157	105,5	40,5	186,8	193,7	157,8	42	67,4	1169,90	97,49
	max temp	degrees celcius	34,8	35,7	35,7	30,5	31,7								NA	33,68
	min temp	degrees celcius	17,1	19,1	19,4	18,9	18,8	18,2	18,6	18,5	18,3	18,5	17,6	17,5	NA	18,38
	windrun	km													NA	0,00
2010	humidity	%	62	67	82	77	81	80	85	86	79	83	79	68	NA	77,42
	rainfall	mm	7,8	138,9	77	39,8	210,6	182,7	161,8	120	224,4	138,8	33,7	4,2	1339,70	111,64
	max temp	degrees celcius													NA	0,00
	min temp	degrees celcius	17,9	20,8	19,4	19,6	19,5	19,8	18,6	18,6	18,1	18,3	17,6	18,7	NA	18,91
	windrun	km													NA	0,00
Monthly Mean	humidity (05-10)	%	61,17	63,83	71,50	72,00	80,50	80,17	85,67	84,17	81,33	79,33	75,00	64,83	NA	74,96
	rainfall	mm	23,49	19,61	81,45	147,08	139,37	135,86	130,53	150,45	127,97	149,03	93,31	34,81	1232,96	102,75
	max temp	degrees celcius	34,01	35,51	33,91	30,74	31,21	30,89	29,79	30,16	29,98	30,07	31,52	32,36	NA	31,68
	min temp	degrees celcius	16,02	17,44	18,44	18,51	18,11	17,74	17,32	17,36	16,93	17,08	16,56	12,78	NA	17,02
	windrun (05-10)	km	47,77	52,02	38,75	39,38	26,63	25,16	24,56	34,69	36,34	41,03	38,31	38,80	NA	36,95

Office												
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
mm/month	23,49	19,61	81,45	147,08	139,37	135,86	130,53	150,45	127,97	149,03	93,31	34,81
litres/month	1401,093	1170,322	4857,48	8771,586	8311,633	8102,133	7784,572	8972,494	7631,733	8887,483	5564,934	2076,148
days of self sufficiency	7,005467	5,85161	32,3832	87,71586	83,11633	81,02133	77,84572	89,72494	76,31733	88,87483	37,09956	10,38074
	-22,9945	-24,1484	2,383198	57,71586	53,11633	51,02133	47,84572	59,72494	46,31733	58,87483	7,099561	-19,6193
Classroom												
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
mm/month	23,49	19,61	81,45	147,08	139,37	135,86	130,53	150,45	127,97	149,03	93,31	34,81
litres/month	2802,187	2340,644	9714,96	17543,17	16623,27	16204,27	15569,14	17944,99	15263,47	17774,97	11129,87	4152,296
days of self sufficiency	14,01093	11,70322	64,7664	175,4317	166,2327	162,0427	155,6914	179,4499	152,6347	177,7497	74,19912	20,76148
	-15,9891	-18,2968	34,7664	145,4317	136,2327	132,0427	125,6914	149,4499	122,6347	147,7497	44,19912	-9,23852

ANNEX V. CROP MANUAL

1. GENERAL CONSIDERATIONS ON GREENHOUSE TOMATO PRODUCTION

It is necessary to take some previous considerations in greenhouse tomato crop, to prevent a failure in the production and maximize production yields.

The most important aspects to consider are:

1. **Availability of irrigation water:**

The first step, for even the approach to greenhouse production, is to ensure the supply of quality water for the established crop.

In addition to the quantity and quality of irrigation water required, there are other aspects such as the irrigation system used, the technical capacity of the irrigation system, knowledge of the crop and its water needs, and deficiencies caused by excess or deficit of water irrigation.

2. **Climatological factors of production area:**

It must be taken into account the climatic factors of the region where the crop is established, even though some environmental conditions could be controlled. It should be clear that the less energy and equipment necessary for the proper development of the crop, the lower the cost of production and, therefore, the greater will be the profit for the producer. The parameters to be considered are:

- Speed and prevailing wind direction.
- Maximum, minimum and average temperatures.
- Day and night relative humidity of the crop cycle.
- Light intensity and photoperiod in different seasons.
- Rainfall patterns.

3. **Technical Knowledge:**

Once defined and solved the above aspects, must also be considered the technical aspects regarding to the correct handling of the crop in the greenhouse, and the corresponding training to the operators. Within this same section also should be included some related aspects, such as:

- The variety or hybrid seed set.
- The cost of cultivation: Production costs for cultivation and indirect costs.

4. Infrastructure and Tools:

When developing a productive project of greenhouse vegetables is essential to consider relevant aspects of great economic impact. Such issues are those related to infrastructure and tools.

Among the main parameters to be considered for the production of greenhouse crops, the most important are Temperature, Brightness and Relative Humidity.

Temperature has a strong influence on physiological processes in plants and is usually the most important factor in deciding where to locate the greenhouse; affecting the growth and development of the crop.

The increase in temperature in a greenhouse is primarily due to the sun's energy as a heat source. Northern Uganda is characterized by a high intensity of light generated by high temperatures during the day, with the advantage that during the night the temperature is cold, which promotes the growth and development of tomato.

In a greenhouse, the plastic cover will allow to pass almost all solar radiation during the day and retain the long-wave infrared radiation from the ground, which maintains a temperature much of the afternoon with slightly higher temperatures than the outside temperature.

The material selected coverage and proper installation is an important aspect, as it will influence both the radiation entering the greenhouse and in the percentage of infrared light that leaks through lack of tightness.

The importance of Brightness in a greenhouse is due to the photosynthetic activity of plants, that need the visible light spectrum -between 350-700nm- with an optimum between 430-662 nm, for the assimilation of nutrients.

Usually there is not often trouble with this factor in the case of tomato in Northern Uganda, due to the strong light intensity and the number of hours of sunshine.

Other factors that may affect proper utilization of light are a bad choice of coverage plastic, due to poor transmission of visible light, misdirection of the greenhouse (an east-west orientation is recommended) and covers severely damaged by the time.

Radiation also has a high influence on the quality of the fruit. In the case of tomato, low radiation will cause an increase of the water content in the fruit, affecting the strength and lowering its sugar content.

Another effect of poor lighting is a bad coloring of the fruit; while high radiation reduces the growth and development of the fruit, even being able to cause burns.

By studying the daily evolution of the temperature and relative humidity could be observed that behave inversely, as temperature increases the relative humidity decreases.

Therefore, the relative humidity in a greenhouse usually peaks in the evening and early hours of the morning, and decreases in the hottest hours of the day.

However, when having low daytime temperatures can also be high relative humidity, due to the moisture generated by the plants inside the greenhouse.

The optimum relative humidity for tomato growing is between 50 and 60%. When the relative humidity is low, the pollen gets dehydrated reducing fruit set, and when is high it favors the development of diseases, mainly fungi and bacteria.

Prevention of condensation of water droplets is very important. On sunny days, plant transpiration increases, but because of the high temperature, moisture does not condense. However, at night the temperature drops and the air has less capacity to store water, so it condenses on the cover and leaves of plants promoting the germination of fungal spores that can severely affect tomato crop, such as *Mildiu* and *Botrytis*.

A phenomenon that is directly related to the relative humidity is condensation of water vapour in the greenhouse roof and walls. These droplets have a negative effect on crops and preventing the passage of light and increase the likelihood of developing diseases.

2. CROP MANAGEMENT

2.1 CROP ECOLOGY.

The tomato is a vegetable from temperate to subtropical climates, which does not tolerate frost, since temperatures less than or equal to 0°C the plant dies. Its base temperature is 10°C and for its optimal development should be 22°C.

The optimum temperature for germination is between 25^{O}C and 30°C. Below 10°C or above 40°C the seed does not germinate.

The range of soil temperatures should be 12 to 16°C (minimum of 10°C, maximum of 30°C) and ambient temperature from 20 to 24°C. At temperatures below 10°C or higher than 27°C, it development could be stopped.

The optimum temperature for fruit ripening is 18-24°C; if temperature is under 13°C the fruits have a very slow and poor maturation.

Regarding the light, in tomato the influence of this factor is less than for other crops. The optimum light intensity level is intermediate, but it is desirable an intense brightness when the plant is in production (fruit coloration).

The ideal photoperiod is 12 hours of light daily; if the insolation is less, the development is slow, and if it is greater, the protein synthesis will be difficulted and carbohydrates will accumulate in excess.

Respecting soil texture, tomato grows in light (sandy) and heavy soils (clay), being the best sandy and sandy-loam, with good drainage. Tomato is classified as a vegetable tolerant to acidity, with pH values of 5.0-6.8.

Regarding salinity, it is classified as moderately tolerant, having maximum values of 6,400 ppm to 10 mmhos.

2.2 PRODUCTION PLANT.

The success of a greenhouse tomato planting lies in the production of good quality seedlings.

Crop establishment involves selecting the right variety, good seed, proper soil preparation, transplanting under optimal environmental conditions, proper planting density and good crop management.

When selecting and buying the seed, the batch, storage time and conditions, in addition to data germination, vigor and purity should be reviewed.

In most vegetables at least 90% germination rate and new seeds (two years in the case of tomato) are recommended.

Seed longevity depends mainly on heredity, but also is affected by the conditions during growth, development, harvesting and storage. The tomato seed has an intermediate longevity around three or four years.

Production of seedlings with balled root is defined as producing a seedling in a container that allows keeping the root and substrate intact at transplanting.

Given proper care, the development of the seedling by direct planting in proper beds, '*nursery bed','* is perfectly adequate for the objectives applied.

In greenhouse production systems, tomato seeding is recommended by "transplant" because several advantages:

1. Tillage inside the greenhouse increases the cost, because seeds are expensive, so seedling production in nurseries is more common.

2. Seedlings from nursery bed have greater resistance to pests, diseases and weeds, that one coming from direct seeding.

It is noteworthy to mention that the conditions and quality of water for the production of tomato seedling is different than the conditions for crop production in greenhouse.

For irrigation of seedlings water quality is required. Saline water will difficult rooting and forces to make frequent washes, consisting in applying irrigation to drain the salts at least once weekly, which also hinders fertilization.

Watering has to be performed every day, however, on very hot days (temperatures above 35°C) is recommended to water twice per day.

The amount of water applied should be necessary to completely moisten the seed bed, avoiding excesses.

The seedlings should be transplanted when the seedling reaches a height of 15cm and a good root development.

Once planted the seed and moist the seed bed, it has to wait four to six days, which should not apply irrigation, to germinate and seedlings emerge.

From plant emergency, apply a daily irrigation under conditions of cold and moisture (early morning or late afternoon).

If the days are very hot, two daily irrigations should be applied. These waterings must be constant from the time of the emergence of seedlings at the time of transplantation, approximately 30 days after planting.

2.3 SOIL PREPARATION.

The purpose of soil preparation is to provide an enabling environment for plant root development, improving aeration and soil structure.

It is recommended that the soil will be completely soft and crumbled to facilitate subsequent cultural practices, such as the incorporation of organic matter, irrigation and fertilizer incorporation to facilitate their penetration into deeper layers.

2.4 TRANSPLANT.

1. Pre-transplant.

Two weeks before transplanting is recommended that a basic fertilization, when preparing growing beds, adding manure, in order to increase soil microbial activity, promote aeration, improve soil structure and provide the necessary nutrients.

Applying heavy irrigation, or pre-transplant irrigation, 24 hours prior to transplantation facilitate settlement of new bedding plants.

2. Transplantation.

The establishment of the crop has to be done when the previous preparations have been done, aimed at initiating the production cycle in the greenhouse.

Plants must be transplanted when have the size, vigor and root development desired. It is necessary to conduct weekly sampling of seedlings, but **the optimal time considered is 30 days after sowing seed or when the seedling reaches about 15 cm in height**.

For transplantation, is extremely important to have **wet and fluffy planting beds**, in order to ensure a rapid root development.

It is advisable to carry out this operation or during the early hours of the morning when the sun is low, or late afternoon.

Defining a framework suitable for planting is critical to success in the crop site, especially under drip irrigation.

A spacing of 40cm between plants is more than enough to allow good root development, coinciding with the distance between drips in the irrigation line**.**

2.5 IRRIGATION.

Tomato crop requires evenly moisture throughout the growing cycle. Therefore it is important the availability of water at all times.

The most important aspect for drip irrigation systems is water quality. The most important factors are: electrical conductivity, pH and SAR (Sodium Adsorption Ratio).

Waters with higher concentrations of sodium (Na) are more problematic because, besides compete for water with plant and clog irrigation lines, increase the pH and carbonate concentration, causing deficiencies in iron concentrations (Fe) and zinc (Zn); becoming waterproof floor and reducing aeration.

Crops differed in salt tolerance. Tomato crop is halotolerant, experiencing a decrease of its performance with increasing salt concentration in the soil.

The drip irrigation system is a method by which water is applied in small amounts, in a controlled way and localized to the root zone of the plant.

It consists of a series of drilled tracts which are located in the bed. When combined with fertirrigation, yields increase significantly, as the product quality and earliness.

Its main advantage is that it reduces the amount of water used and provides a great uniformity of crop water throughout the cycle, if well managed.

The distance between drips in each irrigation line must be 40cm, with a total flow per line between one and two liters per hour.

Regardless of irrigation system used, a methodology is needed to determine the frequency of irrigation. In semi-arid climates such as the Northern Uganda, at least one daily watering is required.

The risks have to adapt to the needs of the crop, avoiding excesses or defects that would involve yield losses, rotting or fruit rickets, but offsetting losses by evapotranspiration.

2.6. CULTURAL PRACTICES.

Pruning:

It is a must for indeterminate varieties practice. Takes place within 15-20 days after the transplant, with the appearance of the first side branches, which will be eliminated, as the older leaves, thus improving aeration of the neck and facilitate the realization of ridging. Also the number of arms (stems) to stop is determined by plant. Are frequent pruning to one or two arms

Ridging and recess:

Operation performed on soils sanded after pruning, in order to favor the formation of a larger number of roots, which consists in covering the underside of the ground sand.

The recess is a variant of that earthing, carried out by bending the plant, after being slightly scraped, until it comes in contact with the ground, covering it lightly with sand, leaving out the terminal bud and two leaves.

Weeding:

Operation to keep in mind, since in the greenhouse should be no other plant than the crop that wants to produce.

This is done to prevent the diversion of nutrients to plants other than the crop to produce and to reduce the chance of harboring pests. The clearing has to be done periodically and manually.

Stringing:

It is a must for keeping the plant stand and preventing leaves, and especially fruits, off the ground, thus improving the overall aeration of the plant and encouraging the use of radiation and conducting cultural work (defoliating, harvesting...).All this will affect the final production, fruit quality and disease control.

The fastening is usually done with polypropylene thread (raffia) tieing an end to the basal area of the plant (busy, knotted or attached by loops) and the other to a wire located at a particular height above the plant (1.8 -2.4m above the ground).

As the plant grows, it is being roll to the holding thread by rings, until the plant reaches the wire. At this time there are three options:

1. Fall the plant picking up the thread, which carries an additional cost labor. This system is beginning to be introduced to the use of a clamping mechanism called 'Dutch', which involves placing hangers with wire wrapped around them to go dropping as the plant grows, holding the wire through clips. In this way the plant develops always upwards, receiving the maximum light output, so that an improvement affects fruit quality and an increase in production.
2. Allow the plant to grow on its own gravity falling.
3. Allow the plant grows horizontally on wires grate.

Destalking:

It involves the removal of axillary buds to improve the development of the main stem. It should be performed as often as possible to avoid loss of photosynthetically-active biomass and making wounds.

The cuts should be clean to prevent the possible entry of diseases. In times of risk is advisable to perform a phytosanitary treatment with a fungicide-bactericidal healing, such as derivatives of copper.

Defoliating:

It is recommended in senescent leaves, to facilitate aeration and improved fruit color, and diseased leaves, to be drawn immediately from the gases, thereby eliminating the source of disease.

Emergence of inflorescences and fruit thinning:

Both practices are performed in order to standardize and increase the size of the remaining fruit and its quality. In general, two types of thinning could be distinguished: systematic thinning, which is an operation that takes place on the clusters, leaving a fixed number of fruits, eliminating poorly positioned immature fruits; and selective thinning,

which occurs on fruits to satisfy certain conditions regardless of their position in the cluster, such as fruits damaged by insects, deformed and those who have a reduced caliber.

2.7 HARVEST.

Harvesting of tomato grown in greenhouse **starts when the fruits have reached physiological** maturity, this is achieved **at 90-100 days after transplantation**, or 50-60 days after anthesis.

Physiological maturity of tomatoes is defined as the state in which the fruit reaches its final size and start maturation inside.

A physiologically fruit is ripe when discolouration on the outside bottom of the fruit, which has a whitish star-shaped can be appreciated.

ANNEX VI. SYLLABUS

1. PROGRAM STRUCTURE OUTLINE

	CERTIFICATE IN GENERAL AGRICULTURE	Semester I	
Course code	Course name	Learning hours	Credit units
CGA101	Principles of Agriculture	40	4
CGA102	Soils science	40	4
CGA103	Annual crops	40	4
CGA104	Farm planning	40	4
CGA105	Farm practices I	60	6
	TOTAL	**220**	**22**
		Semester II	
CGA201	Home economics	40	4
CGA202	Horticulture	40	4
CGA203	Crop protection	40	4
CGA204	Sustainable Agriculture Development	50	5
CGA205	Farm practices II	60	6
	TOTAL	**230**	**23**

2. DETAILED COURSE DESCRIPTION

	Semester I
Course name	PRINCIPLES OF AGRICULTURE
Teacher	Prof. LAGUDY
Course code	CGA101
Credit units	4

COURSE DESCRIPTION:

This course covers the following areas: Introduction to climatology and meteorology, Land tenure and farming systems in Uganda, Basics of crop management.

COURSE OBJECTIVES:

1. To instill in the student the general concepts in agriculture.
2. To enable the student to identify different farming systems.
3. To introduce the students to basic concepts in climatology.

LEARNING OUTCOMES:

Students should be able:

1. To explain the basics of crop management.
2. To identify different farming systems.
3. To interpret climatology data.

COURSE CONTENTS:

Introduction to climatology and meteorology, Land tenure and farming systems in Uganda, Basics of crop management

ASSESSMENT METHODS:

This course will be assessed through continuous assessment and final examination. Continuous assessment evaluates the continuous performance of students before sitting the final examination.

It will be done in form of tests, assignments and tutorials, constituting 20% of the final student's score.

The final examination will constitute 80% of the final score and it includes a written examination, which constitutes 30% of the score, and a practical examination, which constitutes 50% of the final score.

	Semester I
Course name	SOIL SCIENCE
Teacher	Prof. OCITI
Course code	CGA102
Credit units	4

COURSE DESCRIPTION:

This course involves the study of the origin morphology, distribution and properties of soil. It also involves the study of soil productivity improvement, soil and water conservation, in addition to irrigation for purposes of agricultural production in areas where rainfall is either insufficient or poorly distributed.

COURSE OBJECTIVES:

1. To appreciate the importance of soil in agriculture.
2. Carry out practices that maintain/improve soil fertility.
3. Carry out practices that conserve soil and water.

LEARNING OUTCOMES:

Students should be able:

1. To explain what soils are, their importance and distinguishing different approaches used in its study.
2. To explain the constituents of soil.
3. To difference soil horizons.
4. To explain and identify different structural and textural classes of soil
5. To make and use different types of organic manure.
6. To carry out measures to conserve soil and water for agricultural production.
7. To carry out simple irrigation methods.
8. To drain excess water from water logged land.

COURSE CONTENTS:

1. Introduction to soil science. Morphological study of soils, types of soils, soils components.
2. Physical properties of the soil. Soil texture and structure, soil water, air, temperature.
3. Soil organic matter. Sources, roles, organic manure making techniques.
4. Soil organisms.
5. Water and soil conservation. Soil erosion, effects and agents, measures to control soil and water losses.

6. Irrigation. Benefits and limitations, extent of irrigation in Uganda, types of irrigation.
7. Drainage. Need for drainage, methods of drainage.

ASSESSMENT METHODS:

This course will be assessed through continuous assessment and final examination. Continuous assessment evaluates the continuous performance of students before sitting the final examination.

It will be done in form of tests, assignments and tutorials, constituting 20% of the final student's score.

The final examination will constitute 80% of the final score and it includes a written examination, which constitutes 30% of the score, and a practical examination, which constitutes 50% of the final score.

	Semester I
Course name	ANNUAL CROPS
Teacher	Prof. OKEMA
Course code	CGA103
Credit units	4

COURSE DESCRIPTION:

This course involves the study of annual crops production, its importance and the agronomic practices involved.

COURSE OBJECTIVES:

1. To defines cereal, legume, tuber and root crops.
2. To outline their economic importance.
3. To explain the distribution of each crop in Uganda.
4. To outline, described and demonstrate the various agronomic practices involved, e.g seed bed preparation, planting, weeding, fertilizer application, pest and disease control methods, harvesting and threshing.

LEARNING OUTCOMES:

Students should be able:

1. To define a cereal, legume, tuber and root crop.
2. To outline their economic importance.
3. To explain the distribution of each crop in Uganda.
4. To outline, described and demonstrate the various agronomic practices involved, e.g seed bed preparation, planting, weeding, fertilizer application, pest and disease control methods, harvesting and threshing.
5. To make and use different types of organic manure.

COURSE CONTENTS:

Cereals, legumes, tuber and root crops, oil crops and fiber crops.

ASSESSMENT METHODS:

This course will be assessed through continuous assessment and final examination. Continuous assessment evaluates the continuous performance of students before sitting the final examination.

It will be done in form of tests, assignments and tutorials, constituting 20% of the final student's score.

The final examination will constitute 80% of the final score and it includes a written examination, which constitutes 30% of the score, and a practical examination, which constitutes 50% of the final score.

	Semester I
Course name	FARM PLANNING
Teacher	Prof. OBORA
Course code	CGA104
Credit units	4

COURSE DESCRIPTION:

This course introduces students to know and gain skills of planning and developing farm land.

COURSE OBJECTIVES:

The student should know the theory of farm planning and developing farm land.

LEARNING OUTCOMES:

The student should know how to plan and develop a farm land

COURSE CONTENTS:

1. Elementary land survey.
2. Land use planning.
3. Farm development.
4. Construction of simple farm structures (solar dryers, poultry paddocks...)
5. Post harvesting technologies.

ASSESSMENT METHODS:

This course will be assessed through continuous assessment and final examination. Continuous assessment evaluates the continuous performance of students before sitting the final examination.

It will be done in form of tests, assignments and tutorials, constituting 20% of the final student's score.

The final examination will constitute 80% of the final score and it includes a written examination, which constitutes 30% of the score, and a practical examination, which constitutes 50% of the final score.

	Semester I
Course name	FARMING PRACTICES I
Teacher	Prof. OMONYI
Course code	CGA105
Credit units	6

COURSE DESCRIPTION:

This course is designed to give students a hands-on experience in farming practices, by giving them the opportunity to put on practice all the theory learned during the course..

COURSE OBJECTIVES:

1. To carry out routine agricultural production activities.
2. To identify and solve farm problems.

LEARNING OUTCOMES:

Students should be able:

1. To know farm infrastructure, water resources and alternative construction materials.
2. To appreciate the special aspects of farming activities in a market oriented agriculture.
3. To adopt improved/modern farming methods.

COURSE CONTENTS:

Field training in farming activities, analysis of the farming systems and community practices.

ASSESSMENT METHODS:

This course will be assessed through continuous assessment and final examination. Continuous assessment evaluates the continuous performance of students before sitting the final examination.

It will be done in form of tests, assignments and tutorials, constituting 20% of the final student's score.

The final examination will constitute 80% of the final score and it includes a written examination, which constitutes 10% of the score, and a practical examination, which constitutes 70% of the final score.

	Semester II
Course name	HOME ECONOMICS
Teacher	Prof. OBORA
Course code	CGA201
Credit units	4

COURSE DESCRIPTION:

This course involves the study of how to manage the home economy of farming households. Saving and generating incomes from farming activities.

COURSE OBJECTIVES:

1. To enable the students to understand and manage the home in a planned way to become self-reliant.
2. To know the basics of human nutrition and food science and how to feed the family in a healthy way.
3. To acquire social integration skills.

LEARNING OUTCOMES:

Students should be able:

1. To explain the meaning home economics, appreciate the role of women in development, and identify family goals.
2. To appreciate the importance of child care and development.
3. To explain the meanings of family planning and responsible parenthood.
4. To define nutrition, malnutrition and balanced diet. To define food spoilage and state the principles of food preservation.
5. To acquire practical skills in kitchen cleanliness, keep a well-planned kitchen, economically use of fuel and stoves.
6. To open their minds in an inclusive way, interacting with disabled people.

COURSE CONTENTS:

Introduction to home economics, social and community dynamics, development theory, human nutrition, health and hygiene, food processing.

ASSESSMENT METHODS:

This course will be assessed through continuous assessment and final examination. Continuous assessment evaluates the continuous performance of students before sitting the final examination.

It will be done in form of tests, assignments and tutorials, constituting 20% of the final student’s score.

The final examination will constitute 80% of the final score and it includes a written examination, which constitutes 10% of the score, and a practical examination, which constitutes 70% of the final score.

	Semester II
Course name	HORTICULTURE
Teacher	Prof. OKEMA
Course code	CGA202
Credit units	4

COURSE DESCRIPTION:

This course introduces the students to the production of horticultural crops.

COURSE OBJECTIVES:

1. To acquire knowledge in how to produce horticultural crops.

LEARNING OUTCOMES:

Students should be able:

1. To acquire knowledge for economic production of horticultural crops.

COURSE CONTENTS:

Introduction to horticultural crops, nursery practices, local vegetables.

ASSESSMENT METHODS:

This course will be assessed through continuous assessment and final examination. Continuous assessment evaluates the continuous performance of students before sitting the final examination.

It will be done in form of tests, assignments and tutorials, constituting 20% of the final student's score.

The final examination will constitute 80% of the final score and it includes a written examination, which constitutes 10% of the score, and a practical examination, which constitutes 70% of the final score.

	Semester II
Course name	CROP PROTECTION
Teacher	Prof. OCITI
Course code	CGA203
Credit units	4

COURSE DESCRIPTION:

This course involves the study of pest and diseases in local crops.

COURSE OBJECTIVES:

1. To identify local pests and diseases.

LEARNING OUTCOMES:

Students should be able:

1. To recognize damage in crops by pests and diseases.

COURSE CONTENTS:

Common pests, sustainable methods of pest controls, common weeds, symptoms and causes, spread of most important plant diseases, sustainable methods of disease control.

ASSESSMENT METHODS:

This course will be assessed through continuous assessment and final examination. Continuous assessment evaluates the continuous performance of students before sitting the final examination.

It will be done in form of tests, assignments and tutorials, constituting 20% of the final student's score.

The final examination will constitute 80% of the final score and it includes a written examination, which constitutes 10% of the score, and a practical examination, which constitutes 70% of the final score.

	Semester II
Course name	SUSTAINABLE AGRICULTURE DEVELOPMENT
Teacher	Prof. LAGUDY
Course code	CGA204
Credit units	5

COURSE DESCRIPTION:

This course introduces students to the essentials of Sustainability and Agriculture development.

COURSE OBJECTIVES:

1. To enable the students to explains and understand the essentials of Sustainability and Agriculture development.

LEARNING OUTCOMES:

Students should be able:

1. To explain the meaning of growth and development.
2. To explain the characteristics of Agriculture in developing countries.
3. To explain the importance of Agriculture in Uganda's economic development.
4. To explain the essentials for attaining agricultural development.
5. To explain agricultural projects, importance of projects and several project stakeholders, and explain the different stages of a project cycle.
6. To prepare a project proposal.

COURSE CONTENTS:

1. Agricultural development. Basis for agricultural development, stages of agricultural development –subsistence, semi-subsistence and commercial agriculture-.
2. Importance of Agriculture in national economic development. Nutrition, raw materials, export commodities, labor employer, source of incomes, characteristics of agriculture in developing countries and essentials for agricultural development.
3. Agricultural projects cycle and proposal writing. Concept of agricultural projects, project stakeholders, stages of project cycle –identification, planning, appraisal, selection, implementation, monitoring and evaluation writing-, project proposal and its elements

ASSESSMENT METHODS:

This course will be assessed through continuous assessment and final examination. Continuous assessment evaluates the continuous performance of students before sitting the final examination.

It will be done in form of tests, assignments and tutorials, constituting 20% of the final student's score.

The final examination will constitute 80% of the final score and it includes a written examination, which constitutes 10% of the score, and a practical examination, which constitutes 70% of the final score.

	Semester I
Course name	FARMING PRACTICES II
Teacher	Prof. OMONYI
Course code	CGA205
Credit units	6

COURSE DESCRIPTION:

This course is designed to give students a hands-on experience in farming practices, by giving them the opportunity to put on practice all the theory learned during the course.

COURSE OBJECTIVES:

3. To carry out routine agricultural production activities.
4. To identify and solve farm problems.

LEARNING OUTCOMES:

Students should be able:

4. To know farm infrastructure, water resources and alternative construction materials.
5. To appreciate the special aspects of farming activities in a market oriented agriculture.
6. To adopt improved/modern farming methods.

COURSE CONTENTS:

Field training in farming activities, analysis of the farming systems and community practices.

ASSESSMENT METHODS:

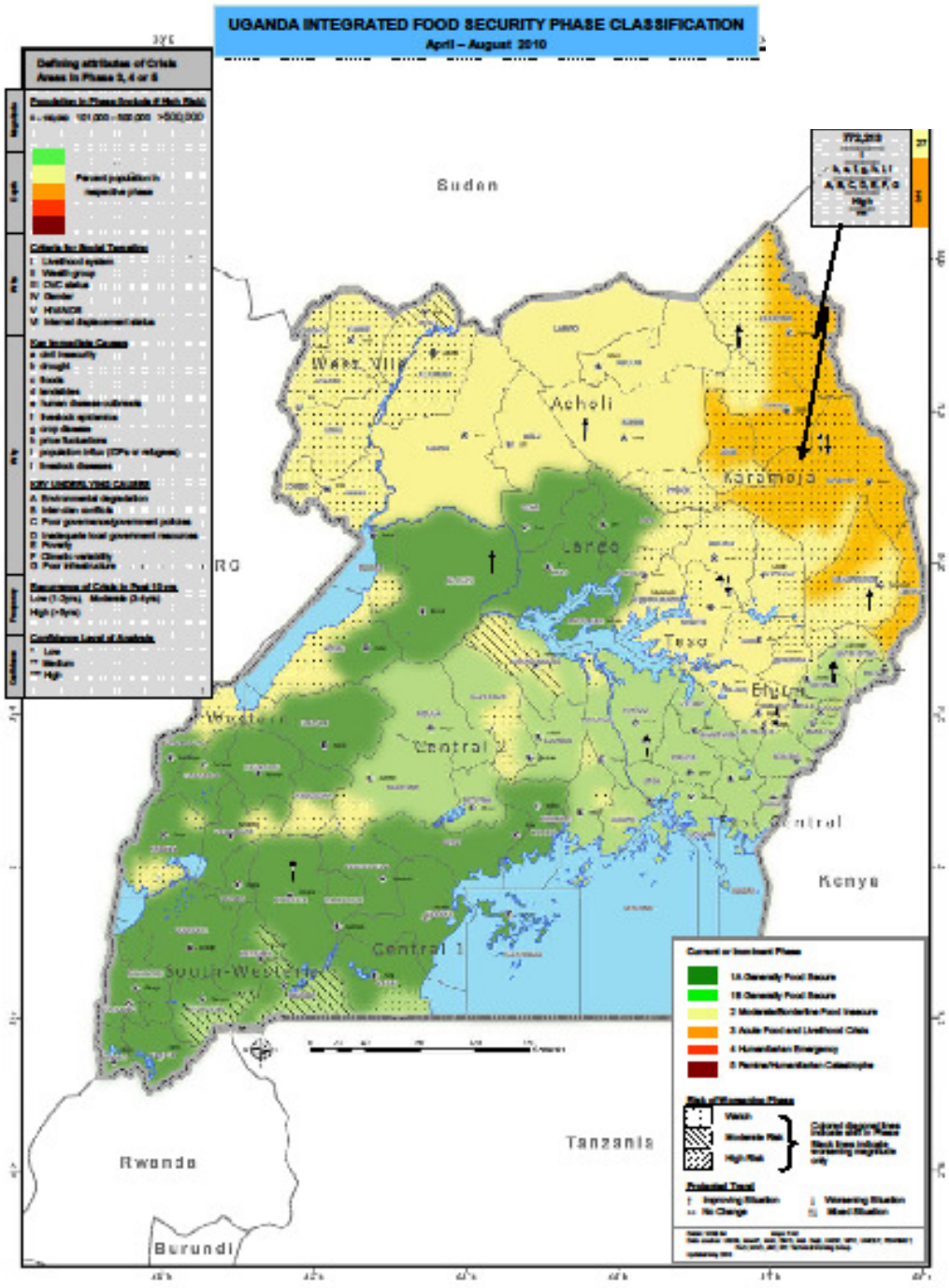
This course will be assessed through continuous assessment and final examination. Continuous assessment evaluates the continuous performance of students before sitting the final examination.

It will be done in form of tests, assignments and tutorials, constituting 20% of the final student's score.

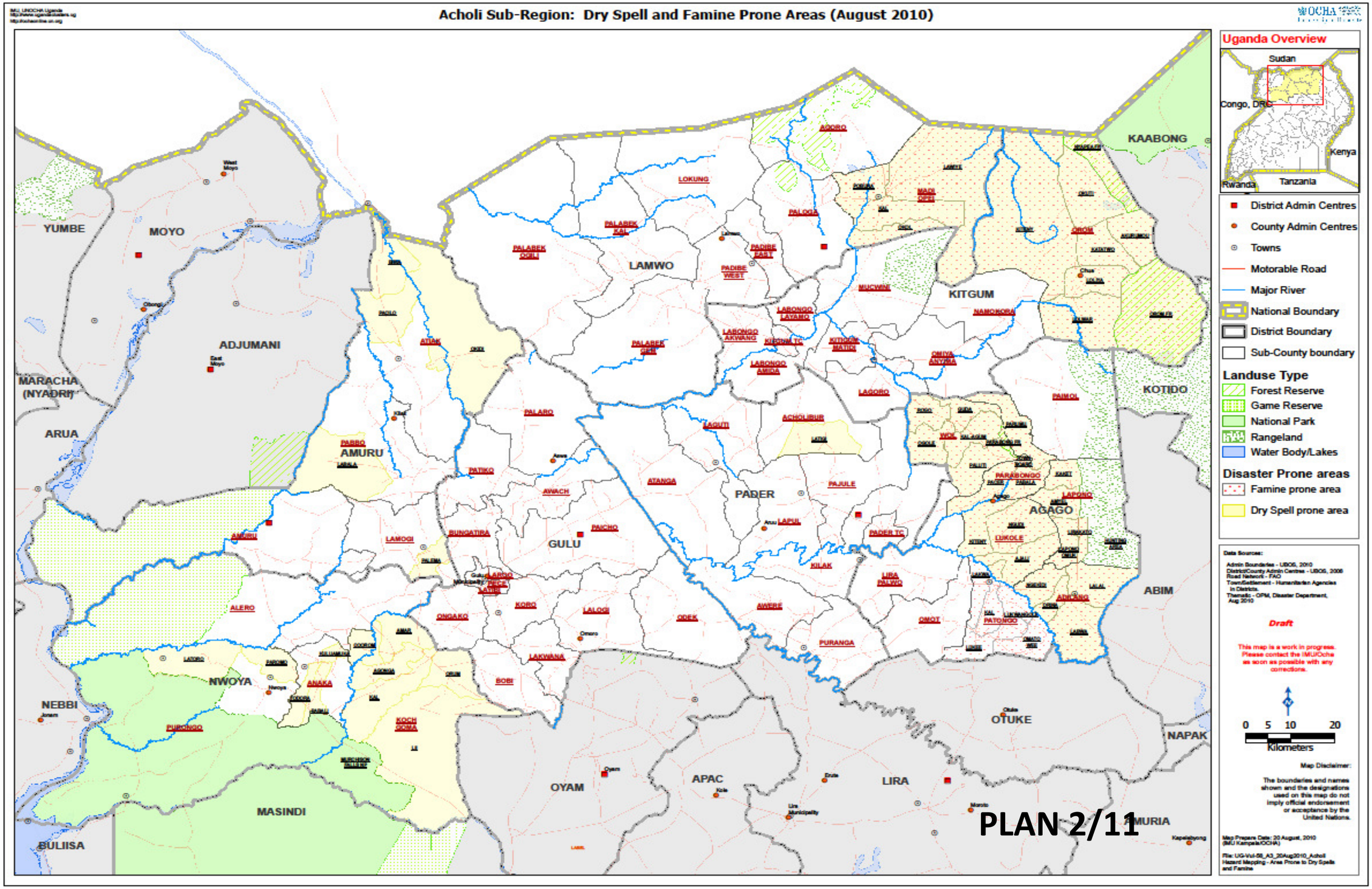
The final examination will constitute 80% of the final score and it includes a written examination, which constitutes 10% of the score, and a practical examination, which constitutes 70% of the final score.

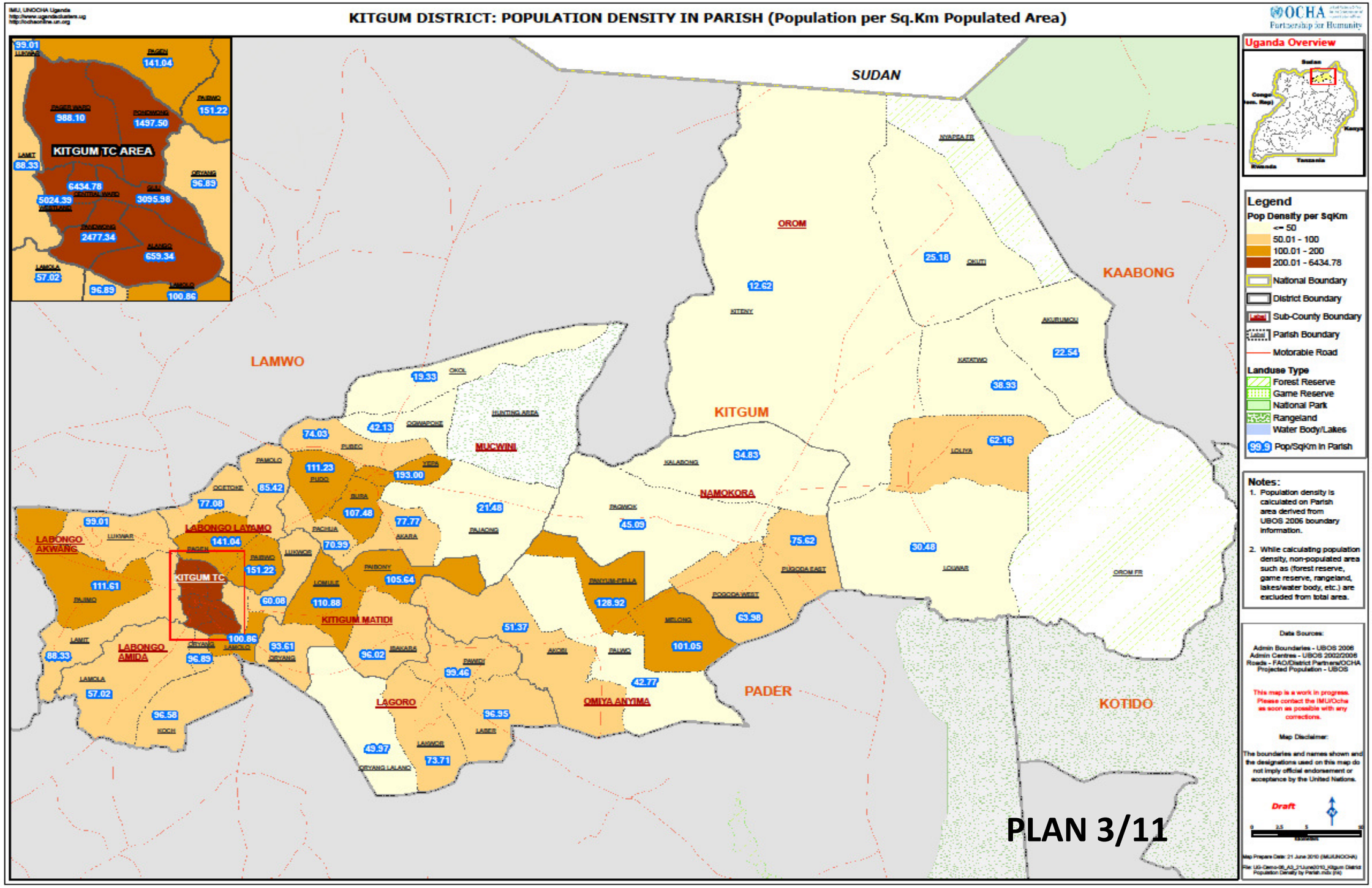
DOCUMENT 2. PROJECT PLANS

PLANS INDEX


UGANDA INTEGRATED FOOD SECURITY PHASE CLASSIFICATION
April – August 2010
Sudan
Acholi
Karamoja
Lango
Teso
Central 2
Central 1
South-Western
Kenya
Tanzania
Rwanda
Burundi

PLAN 1/11


Acholi Sub-Region: Dry Spell and Famine Prone Areas (August 2010)
OCHA
Uganda Overview
Sudan
Congo, DRC
Kenya
Rwanda
Tanzania
District Admin Centres
County Admin Centres
Towns
Motorable Road
Major River
National Boundary
District Boundary
Sub-County boundary
Landuse Type
Forest Reserve
Game Reserve
National Park
Rangeland
Water Body/Lakes
Disaster Prone areas
Famine prone area
Dry Spell prone area
Data Sources:
Admin Boundaries - UBOS, 2010
District/County Admin Centres - UBOS, 2006
Road Network - FAO
Town/Settlement - Humanitarian Agencies in Districts
Thematic - OPM, Disaster Department, Aug 2010
Draft
This map is a work in progress. Please contact the IMU/Ocha as soon as possible with any corrections.
0 5 10 20
Kilometers
Map Disclaimer:
The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.
Map Prepare Date: 20 August, 2010
(IMU Kampala/OCHA)
File: UG-Vul-58_A3_20Aug2010_Acholi Hazard Mapping - Area Prone to Dry Spells and Famine
YUMBE
MOYO
ADJUMANI
MARACHA (NYADRI)
ARUA
AMURU
NEBBI
NWOYA
MASINDI
BULIISA
GULU
LAMWO
KITGUM
PADER
AGAGO
KAABONG
KOTIDO
ABIM
NAPAK
OTUKE
LIRA
APAC
OYAM
PLAN 2/11


IMU, UNOCHA Uganda
http://www.ugandaclusters.ug
http://ochaonline.un.org
KITGUM DISTRICT: POPULATION DENSITY IN PARISH (Population per Sq.Km Populated Area)
OCHA
Partnership for Humanity
Uganda Overview
Sudan
Congo (Dem. Rep)
Kenya
Tanzania
Rwanda
SUDAN
KITGUM TC AREA
99.01
141.04
151.22
588.10
1497.50
68.33
96.89
6434.78
5024.39
3095.98
2477.34
659.34
57.02
96.89
100.86
LAMWO
KITGUM
PADER
KOTIDO
KAABONG
NAMOKORA
MUCWINI
KITGUM MATIDI
LABONGO AKWANG
LABONGO LAYAMO
LABONGO AMIDA
LAGORO
OMIYA ANYIMA
KITGUM TC
OROM
25.18
12.62
22.54
38.93
19.33
74.03
42.13
111.23
193.00
85.42
77.08
107.48
21.48
77.77
99.01
141.04
70.95
105.64
111.61
151.22
60.08
110.88
100.86
93.61
96.89
88.33
57.02
96.58
96.02
51.37
99.46
42.77
96.95
49.97
73.71
34.83
62.16
45.09
75.62
30.48
128.92
63.98
101.05
Legend
Pop Density per SqKm
<= 50
50.01 - 100
100.01 - 200
200.01 - 6434.78
National Boundary
District Boundary
Sub-County Boundary
Parish Boundary
Motorable Road
Landuse Type
Forest Reserve
Game Reserve
National Park
Rangeland
Water Body/Lakes
99.9 Pop/SqKm in Parish
Notes:
1. Population density is calculated on Parish area derived from UBOS 2006 boundary information.
2. While calculating population density, non-populated area such as (forest reserve, game reserve, rangeland, lakes/water body, etc.) are excluded from total area.
Data Sources:
Admin Boundaries - UBOS 2006
Admin Centres - UBOS 2002/2006
Roads - FAO/District Partners/OCHA
Projected Population - UBOS
This map is a work in progress. Please contact the IMU/Ocha as soon as possible with any corrections.
Map Disclaimer:
The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.
Draft
Kilometers
Map Prepare Date: 21 June 2010 (IMU/UNOCHA)
File: UG-Demo-06_A3_21June2010_Kitgum District Population Density by Parish.mxd (rk)

PLAN 3/11

IMU, UNOCHA Uganda
http://www.ugandaclusters.ug
http://ochaonline.un.org

Kitgum District: Humanitarian, Recovery and Development Organizations Presence by Sector per Sub-County (October 2010)

OCHA Partnership for Humanity

Uganda Overview

Legend
- Villages
- Motorable Road
- National Boundary
- District Boundary
- Sub-County Boundary

LAMWO

Akwang

S/N	Humanitarian	Development & Recovery
1	JRS	USAID/NUTI,BRAC,UNICEF
2		FAO, WFP,
3	ACET,	
5	JRS, CHAPS, WCH	UNDP
7	CHAPS, MP,COW Foundation	AVSI,UNICEF,WHO,AVSI
8	FHU,UNFPA,ACET,DOK,KICWA, IRC, WCH, JPC, UNHCR,	OHCHR, UNICEF
12	CARITAS	UNICEF

Layomo

S/N	Humanitarian	Development & Recovery
1	FHU,WCH	BRAC,UNICEF
2	KIDFA,	FAO,WFP
3		NRC
4		NRC
5	ACET,WCH,CHAPS	UNDP
7	IRC, FHU, CHAPS, ACET, MP	AVSI,UNICEF, WHO,AVSI
8	OHCHR,DOK,ACET,WCH,ACDA,JRS, UNHCR, IRC, AMREF,UNICEF	

Muonini

S/N	Humanitarian	Development & Recovery
1	FHU, STF/TT	BRAC,KICWA
2	CPA, KIDFA, FHU, STF/TT,COW Foundation,FAO	OXFAM-GB,KICWA,AVSI
5	ACET,CPA,ACORD, FHU,STF/TT	UNDP
7	IRC, AMREF, CHAPS, COW Foundation	AVSI,UNICEF,WHO
8	OHCHR, FHU, UNHCR,UNFPA, IRC,	UNICEF,
11		CARITAS
12	IRC,OXFAM-GB, FHU	OXFAM-GB, UNICEF

Orom

S/N	Humanitarian	Development & Recovery
1		BRAC,KICWA,AVSI
2	Mercy Corps, LWF,FAO	AVSI,WFP,KICWA
3		AVSI
4		AVSI
5	BRAC	UNDP
7	CowFoundation,BRAC	AVSI, WHO
8	IRC,UNFPA,WCC, OHCHR,	UNICEF,
11	CARITAS	AVSI
12	URCS	AVSI,UNICEF,AVSI

OROM

MUCWINI

LABONGO LAYAMO

LABONGO AKWANG

KITGUM TC

KITIGUM MATIDI

LABONGO AMIDA

NAMOKORA

OMIYA ANYIMA

LAGORO

AGAGO

PADER

Kitgum Matidi

S/N	Humanitarian	Development & Recovery
1		BRAC,USAID/NUTI,KICWA,AVSI
2	IRC, COW Foundation,FAO,WFP	FAO,AVSI, WFP
3	ACET	
5		UNDP, WFP
7	MP, CHAPS, COW-Foundation	AVSI,USAID/NUTI,WHO,AVSI
8	JRS, WCH, UNFPA, WCC, IRC, JPC,	OHCHR,UNDP,UNHCR,UNICEF,
11	CARITAS	AVSI
12		AVSI,UNICEF, AVSI

Namokora

S/N	Humanitarian	Development & Recovery
1	FHU, JRS, CARITAS	USAID/NUTI,BRAC,UNICEF, KICWA,AVSI
2	AVS,CPA,FAO/A2N/LWF	AVSI,WFP,KICWA
3		AVSI
4		USAID/NUTI,AVSI
5		UNDP,USAID/NUTI
7	VIA,COW-Foundation, AMREF, ACET	AVSI,WHO
8	KICWA,WCC,UNFPA,OHCHR, JRS, FHU, IRC,	UNICEF,
11		AVSI
12		AVSI,UNICEF,AVSI

Omiya Anyima

S/N	Humanitarian	Development & Recovery
1		BRAC,KICWA,AVSI
2	FAO, Mercy Corps	AVSI,WFP,KICWA
3		AVSI
4		AVSI
5	CHAPS	UNDP,
7	CHAPS, AMREF, Cow-Foundation	AVSI, WHO
8	IRC,KICWA,COW Foundation, OHCHR, UNFPA, NRC,	UNICEF,
11		AVSI
12		AVSI,UNICEF,AVSI

Kitgum TC

S/N	Humanitarian	Development & Recovery
1	IRC	BRAC,UNICEF,AVSI
2	COW Foundation	AVSI
3		NRC
4		BRAC
5	IRC	UNDP, USAID/NUTI
7	MP, FHU,CHAPS, COW-Foundation,BRAC	AVSI,WHO
8	OHCHR, FHU, KICWA, ACDA, COW-Foundation, IRC, WCC,CPA,	UNICEF,
11		AVSI

Amida

S/N	Humanitarian	Development & Recovery
1	WCH	BRAC,UNICEF,NRC
2	KIDFA, URCS	FAO, WFP,NRC
3		NRC
5	WCH, ACET	UNDP
7	URCS, ACET	AVSI,WHO,UNICEF,AVSI
8	OHCHR, WCH, IRC, JPC, UNHCR	UNICEF,
12		UNICEF,

Lagoro

S/N	Humanitarian	Development & Recovery
1	JRS	BRAC,AVSI
2	FAO,WVU, LWF, WFP,MERCYCORPS	AVSI,NRC
3		AVSI,NRC
4		AVSI
5	ACORD, JRS, AVSI, ACET	UNDP
7	URCS,VIA,MP, CHAPS,COW Foundation	AVSI,WHO,AVSI
8	WCH,JPC, OHCHR, KICWA, IRC, UNHCR, WCC	UNICEF,KICWA
11		AVSI
12		AVSI,UNICEF,AVSI

KITGUM DISTRICT

Agency	Sub-county Presence
A2N	1
ACDA	2
ACET	7
ACORD	2
AMREF	4
AVSI	10
BRAC	10
CARITAS	5
CHAPS	7
COW-Foundation	8
CPA	3
DOK	2
FAO	9
FHU	5
IRC	10
JPC	4
JRS	5
KICWA	8
KIDFA	3
LWF	3
MERCY CORPS	3
MP	5
NRC	5
OHCHR	10
OXFAM-GB	1
STF/TT	1
UNDP	10
UNFPA	6
UNHCR	6
UNICEF	10
URCS	3
USAID-NUTI	4
VIA	2
WCC	5
WCH	5
WFP	8
WHO	10
WVU	1
Agency Count	**38**

S/N	Sector Information
1	Education
2	Food Security & Agricultural Livelihoods
3	Non Agricultural Livelihoods
4	Infrastructure
5	Governance peace Building
6	MINE ACTION
7	Health, Nutrition and HIV/AIDS
8	Protection (Human Rights, Rule of Law, Child Prot, GBV, DCPC)
9	Environmental Conservation
10	Shelter & NFI
11	Pyschosocial Support Programme
12	Water, Sanitation & Hygiene (WASH)

Data Sources:
Admin Boundaries - UBOS 2006 - 2010
Road Network - FAO
IDP Camp/Settlements - Humanitarian Agencies in Kitgum Districts.
Thematic - UNOCHA, Gulu - Jul 2010

WS information are updated by field OCHA office in Gulu with the help of agencies.

Draft

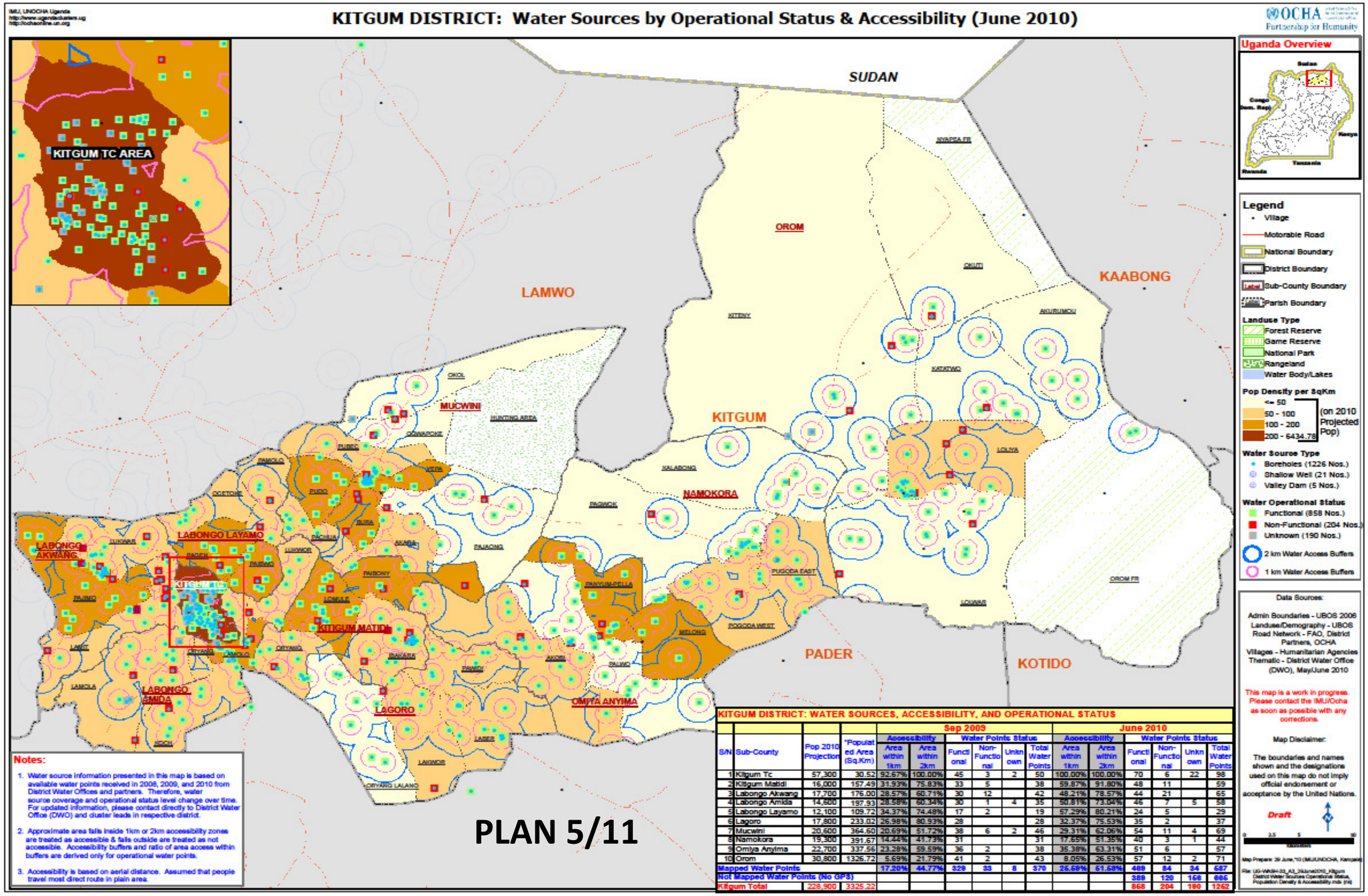
This map is a work in progress. Please contact the IMU/Ocha as soon as possible with any corrections.

Map Disclaimer:
The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

0 2.5 5 10 Kilometers

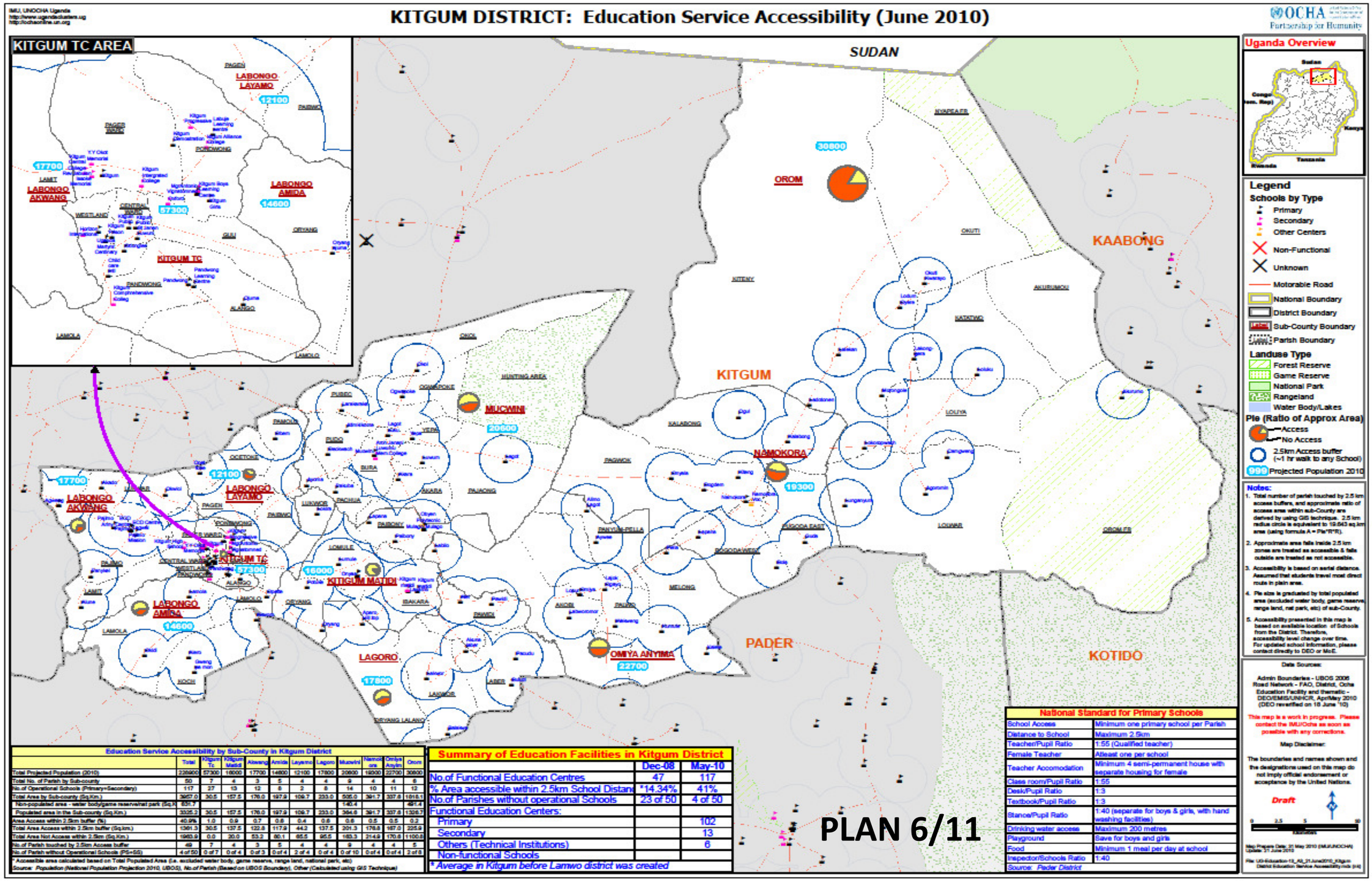
Map Preparation Date: 02 Nov 10 (IMU Kampala/OCHA)
File: UG-WD-71_A3_02Nov10_KitgumDistrict Humanitarian, Recovery and Development Organizations Presence by Sector per Sub-County.mxd (AM)

PLAN 4/11



KITGUM DISTRICT: WATER SOURCES, ACCESSIBILITY, AND OPERATIONAL STATUS

S/N	Sub-County	Pop 2010 Projection	*Populated Area (Sq.Km)	Sep 2009 Accessibility Area within 1km	Sep 2009 Accessibility Area within 2km	Sep 2009 Water Points Status Functional	Sep 2009 Water Points Status Non-Functional	Sep 2009 Water Points Status Unknown	Sep 2009 Water Points Status Total Water Points	June 2010 Accessibility Area within 1km	June 2010 Accessibility Area within 2km	June 2010 Water Points Status Functional	June 2010 Water Points Status Non-Functional	June 2010 Water Points Status Unknown	June 2010 Water Points Status Total Water Points
1	Kitgum Tc	57,300	30.52	92.67%	100.00%	45	3	2	50	100.00%	100.00%	70	6	22	98
2	Kitgum Matidi	16,000	157.49	31.93%	75.83%	33	5		38	59.87%	91.80%	48	11		59
3	Labongo Akwang	17,700	176.00	28.57%	60.71%	30	12		42	48.21%	78.57%	44	21		65
4	Labongo Amida	14,600	197.93	28.58%	60.34%	30	1	4	35	50.81%	73.04%	46	7	5	58
5	Labongo Layamo	12,100	109.72	34.37%	74.48%	17	2		19	57.29%	80.21%	24	5		29
6	Lagoro	17,800	233.02	26.98%	80.93%	28			28	32.37%	75.53%	35	2		37
7	Mucwini	20,600	364.60	20.69%	51.72%	38	6	2	46	29.31%	62.06%	54	11	4	69
8	Namokora	15,300	391.67	14.44%	41.73%	31			31	17.65%	51.35%	40	3	1	44
9	Omiya Anyima	22,700	337.56	23.28%	59.59%	36	2		38	35.38%	63.31%	51	6		57
10	Orom	30,800	1326.72	5.69%	21.79%	41	2		43	8.05%	26.53%	57	12	2	71
Mapped Water Points				17.20%	44.77%	329	33	8	370	26.68%	61.68%	488	84	34	607
Not Mapped Water Points (No GPS)												380	120	156	666
Kitgum Total		228,900	3325.22									868	204	190	1262



Education Service Accessibility by Sub-County in Kitgum District

	Total	Kitgum T/c	Kitgum Matidi	Alowang	Amida	Layamo	Lagoro	Mucwini	Namokora	Omiya Anyim	Orom
Total Projected Population (2010)	228600	57300	16000	17700	14600	12100	17800	20600	19300	22700	30800
Total No. of Parish by Sub-county	50	7	4	3	5	4	4	9	4	4	6
No.of Operational Schools (Primary+Secondary)	117	27	13	12	8	2	8	14	10	11	12
Total Area by Sub-county (Sq.Km.)	3867.0	30.5	157.5	176.0	197.9	109.7	233.0	535.0	391.7	337.8	1616.1
Non-populated area - water body/game reserve/nat park (Sq.K	651.7							140.4			491.4
Populated area in the Sub-county (Sq.Km.)	3025.2	30.5	157.5	176.0	197.9	109.7	233.0	394.6	391.7	337.8	1324.7
Area Access within 2.5km buffer (%)	40.9%	1.0	0.9	0.7	0.8	0.4	0.6	0.8	0.5	0.5	0.3
Total Area Access within 2.5km buffer (Sq.km.)	1361.5	30.5	137.5	122.8	117.9	44.2	137.5	301.3	176.8	167.0	225.9
Total Area Not Access within 2.5km (Sq.Km.)	1663.9	0.0	20.0	53.2	80.1	65.5	95.5	183.3	214.9	170.8	1100.8
No.of Parish touched by 2.5km Access buffer	49	7	4	3	5	4	4	9	4	4	5
No.of Parish without Operational Schools (PSs+SS)	4 of 50	0 of 7	0 of 4	0 of 3	0 of 4	2 of 4	0 of 4	0 of 10	0 of 4	0 of 4	2 of 6

* Accessible area calculated based on Total Populated Area (i.e. excluded water body, game reserve, range land, national park, etc)
Source: Population (National Population Projection 2010, UBOS), No.of Parish (Based on UBOS Boundary), Other (Calculated using GIS Technique)

Summary of Education Facilities in Kitgum District

	Dec-08	May-10
No.of Functional Education Centres	47	117
% Area accessible within 2.5km School Distan	*14.34%	41%
No.of Parishes without operational Schools	23 of 50	4 of 50
Functional Education Centers:		
Primary		102
Secondary		13
Others (Technical Institutions)		6
Non-functional Schools		

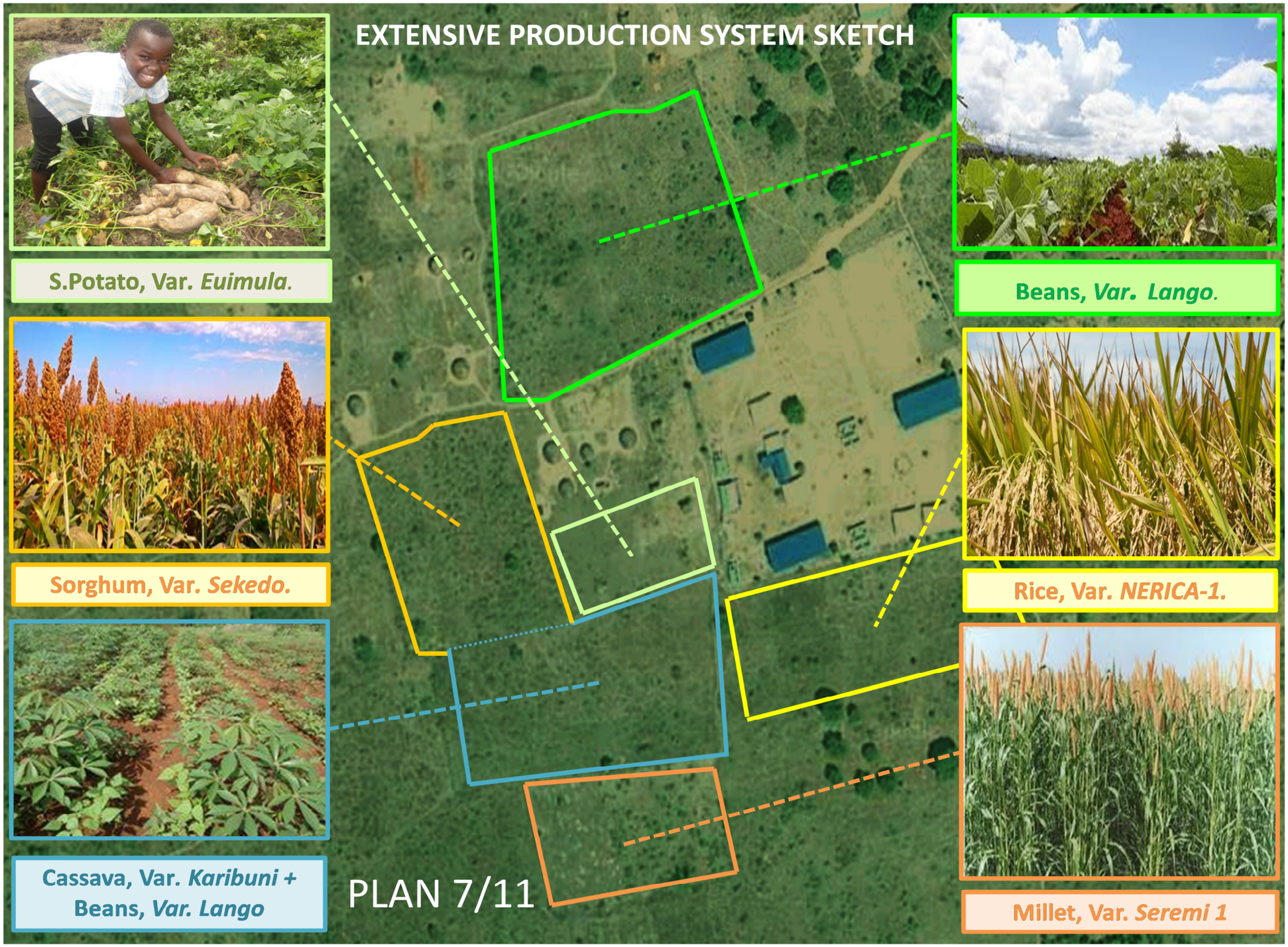
*Average in Kitgum before Lamwo district was created

National Standard for Primary Schools

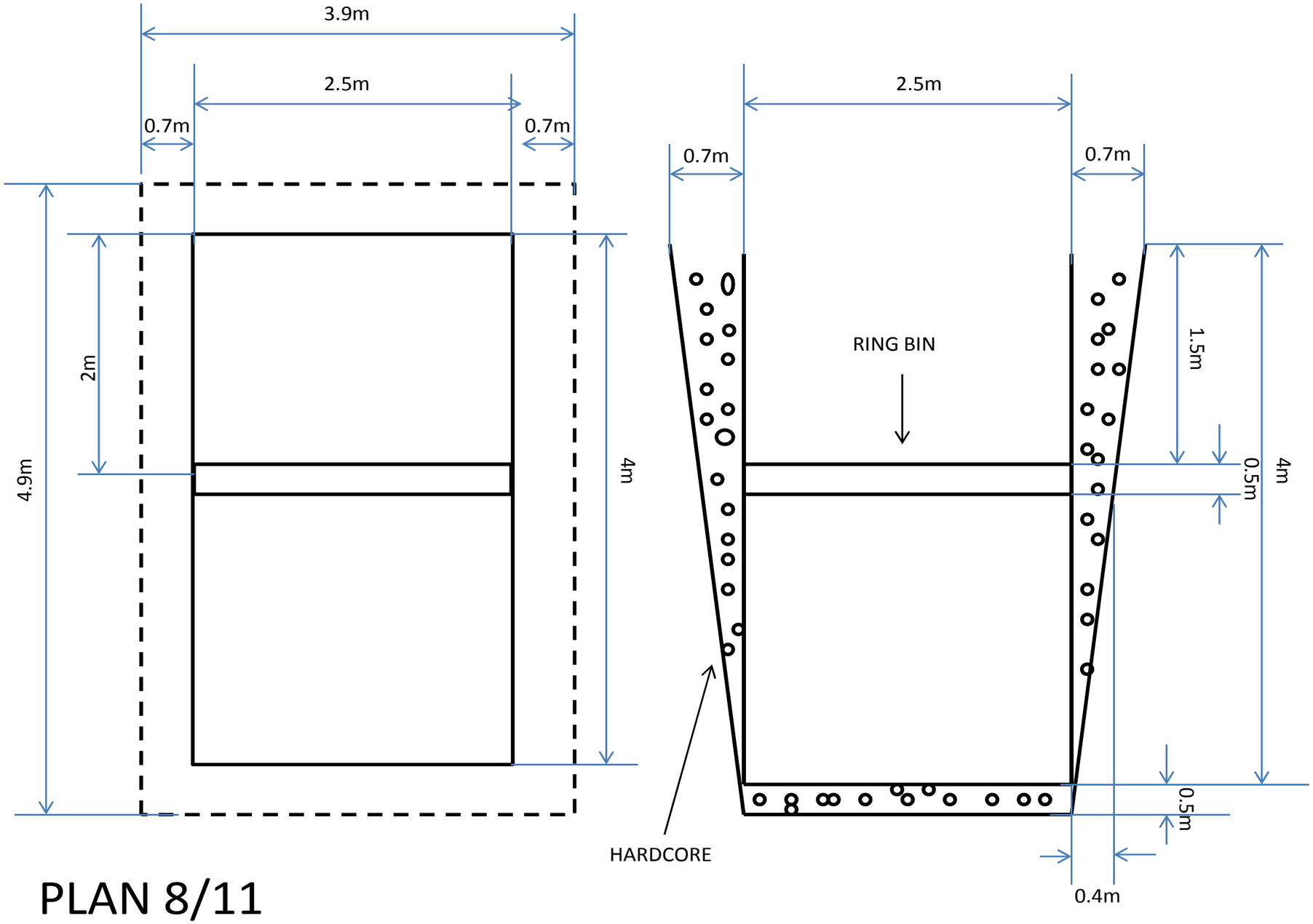
School Access	Minimum one primary school per Parish
Distance to School	Maximum 2.5km
Teacher/Pupil Ratio	1:55 (Qualified teacher)
Female Teacher	Atleast one per school
Teacher Accomodation	Minimum 4 semi-permanent house with separate housing for female
Class room/Pupil Ratio	1:55
Desk/Pupil Ratio	1:3
Textbook/Pupil Ratio	1:3
Stance/Pupil Ratio	1:40 (separate for boys & girls, with hand washing facilities)
Drinking water access	Maximum 200 metres
Playground	Save for boys and girls
Food	Minimum 1 meal per day at school
Inspector/Schools Ratio	1:40

Source: Pader District

PLAN 6/11

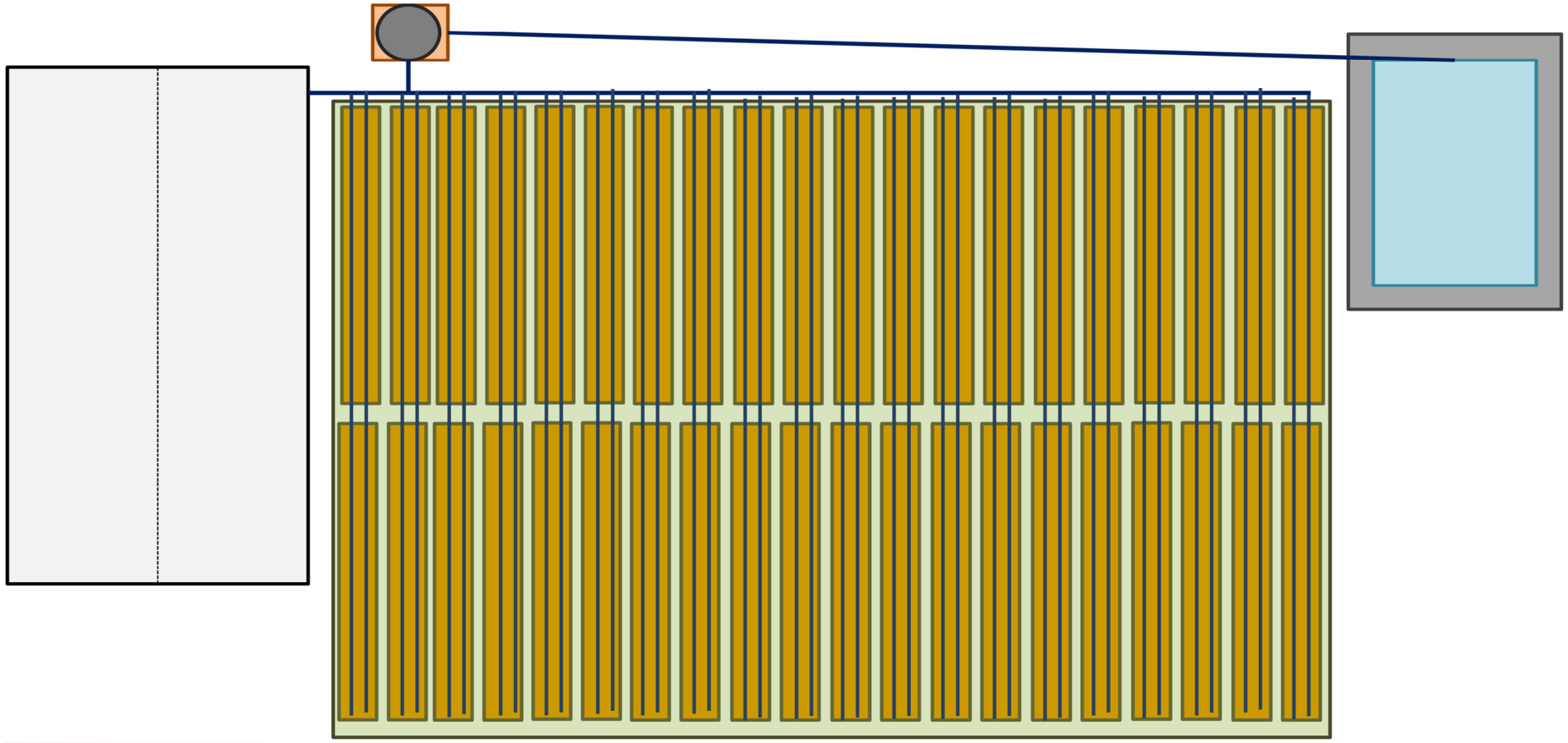

EXTENSIVE PRODUCTION SYSTEM SKETCH
S.Potato, Var. Euimula.
Beans, Var. Lango.
Sorghum, Var. Sekedo.
Rice, Var. NERICA-1.
Cassava, Var. Karibuni +
Beans, Var. Lango
Millet, Var. Seremi 1
PLAN 7/11

RAINFALL WATER HARVESTING POOL SKETCH



PLAN 8/11

INTENSIVE PRODUCTION SYSTEM SKECTH



Var. *Nemo netta*

Var. *Yolo wonder*

Var. *Blackbeauty*

Var. *Nantes*

Var. *Glorya*

PLAN 9/11

INDEX

01- KIDS BEDROOM
02- LATRINES
03- LATRINES
04- SHACK
05- UNICEF-"A" TENT
06- EQUIPMENT
07- KITCHEN and AMAC
08- HOME COOK
09- CHICKEN
10- UNICEF-"B" TENT
11- WAREHOUSE EQUIPMENT FARMING (Antiques Latrines)
12- GIRLS BEDROOM
13- WOMEN SHOWER
14- MEN SHOWER
15- MATERIAL CONTAINER
16- WATCHMEN ROOM
17- OFFICE
18- CLASSROOM-1
19- CLASSROOM-2
20- CLASSROOM-3

UNIVERSIDAD POLITECNICA DE MADRID ESCUELA TECNICA SUPERIOR DE INGENIEROS AGRONOMOS		
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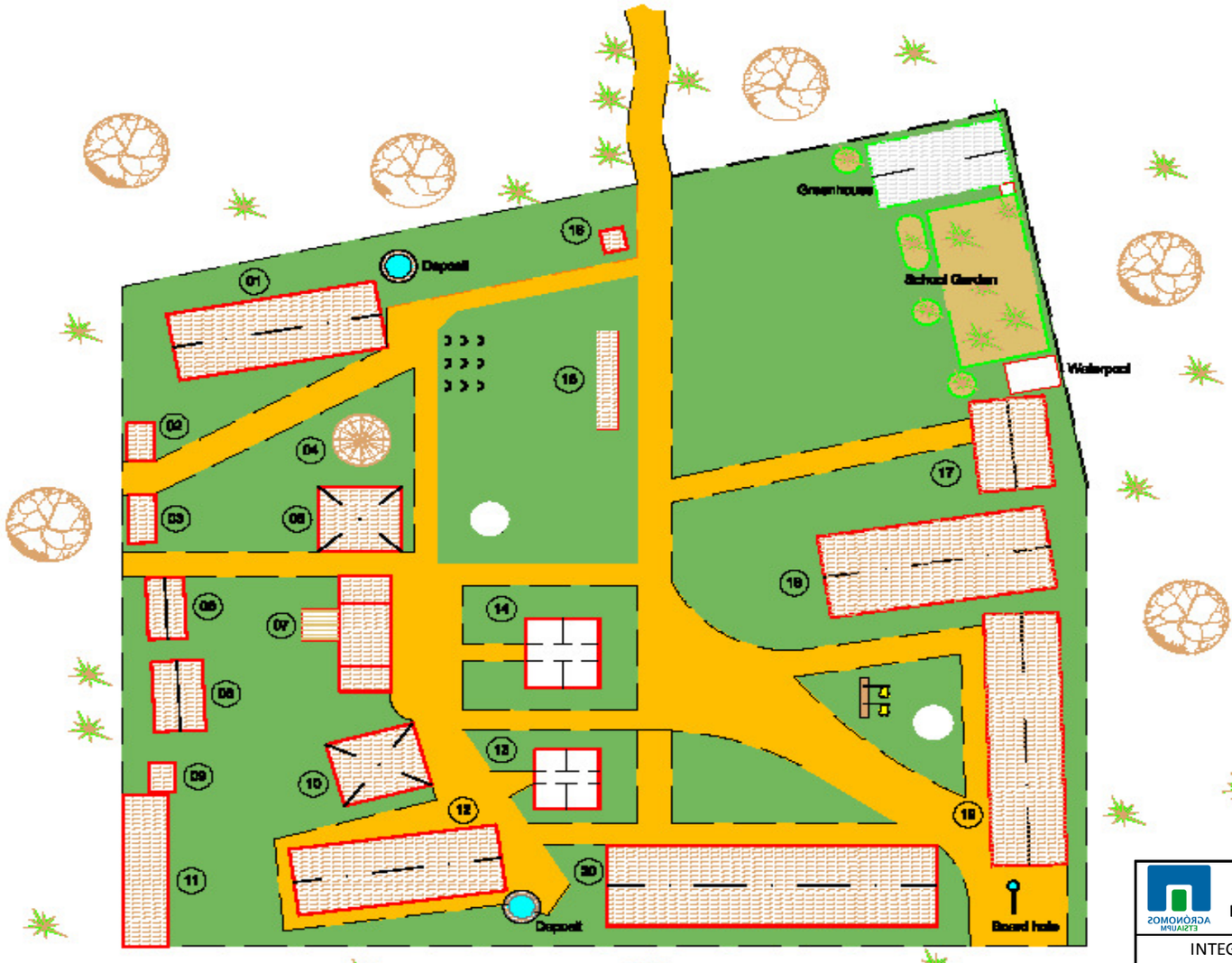
Student: Daniel del Olmo Rovidarcht	**SITUATION BEFORE PROJECT**	Kitgum, Uganda January, 2012
Signature:		SCALE 1:500
		PLAN No 10/11



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UNIVERSIDAD POLITECNICA DE MADRID
ESCUELA TECNICA SUPERIOR DE INGENIEROS AGRONOMOS

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		PLAN No 11/11

DOCUMENT 3. BUDGET

PROJECT'S TOTAL BUDGET

Exchange rate: 1€= 2,700UGSh

SUB TOTAL	AMOUNT (UGsh)	AMOUNT (Euro)
PLOT PURCHASE AND FIRST YEAR RENT	11,455,185	4,242
GREENHOUSE PURCHASE AND INSTALLATION	9,264,170	3,431
IRRIGATION SYSTEM	5,999,481	2,222
GUTTERING AND PUMPING	4,553,332.50	1,686
SEEDS AND TOOLS	2,895,300	1,072.30
AGRICULTURAL TRAINING CENTER	16,848,000	6,240
TOTAL	**51,015,469**	**18,894**

PLOT PURCHASE AND FIRST YEAR RENT

Exchange rate: 1€= 2,700UGSh

ITEM	QUANTITY	UNITS	RATE (UGsh)	AMOUNT (UGsh)	AMOUNT (Euro)
Lot 4					
Lot 4 purchase	1	–	6,725,000	6,725,000	2,490.70
1sr year rental fees					
Lot 3	1	–	1,887,500	1,887,500	699.00
Lot 5	1	–	2,297,200	2,297,200	850.80
SUB-TOTAL				10,909,700	4,040.60
Taxes					
Municipallity taxes	5%	–		545,485	202.00
TOTAL				**11,455,185.50**	**4,242.65**

GREENHOUSE PURCHASE AND INSTALLATION

Exchange rate: 1€= 2,700UGSh

ITEM	QUANTITY	UNITS	RATE (UGsh)	AMOUNT (UGsh)	AMOUNT (Euro)
Purchase of Kit					
Complete Amiran farmers Kit	1	–	3,441,343	3,441,343	1,274
Full accessories of	1	–	3,192,046	3,192,046	1,182
Transportation					
Transportation of kit from Kampala	1	trip	320,000	320,000	118.00
Greenhouses Installation.					
Sand	20	bags	10,000	200,000	74.00
Cement	4	bags	16,500	66,000	24.50
Ballast	20	bags	15,000	300,000	111.10
Bricks	2	load	185,000	370,000	137.00
Black soil	6	load	80,000	480,000	177.80
Labor					
Technician for Installation	1	–	245,500	245,500	90.90
Installation helper	2	–	100,000	200,000	74.00
Labor for water tank construction	2	–	128,000	256,000	94.80
SUB-TOTAL				8,950,889	3,315.20
Unexpected costs					
Unexpected costs	3.5%	–	313,281.10	313,281.10	116.00
TOTAL				**9,264,170.10**	**3,431.20**

IRRIGATION SYSTEM

Exchange rate: 1€= 2,700UGSh

ITEM	QUANTITY	UNITS	RATE (UGsh)	AMOUNT (UGsh)	AMOUNT (Euro)
Water tank					
Cement	40	bags	16,500	660,000	244.40
Hardcore	4	load	340,000	1,360,000	503.70
Bricks	1	load	185,000	185,000	68.50
3/8" Steal	4	20"rib	80,000	320,000	118.50
Pick	2	–	16,600	33,200	12.30
Shovel	2	–	11,500	23,000	8.50
Rope roll	1	–	67,000	67,000	24.80
Surrounding fence	22	meter	24,200	532,400	197.20
Labor					
Excavators	4	–	66,500	266,000	98.50
Off-loading helpers	6	–	5,000	30,000	11.00
Supervisor	1	–	720,000	720,000	266.70
Mason	5	–	320,000	1,600,000	592.60
SUB-TOTAL				5,796,600	2,146.90
Unexpected costs					
Unexpected costs	3.5%	–	202,881	202,881	75.10
TOTAL				**5,999,481**	**2,222**

GUTTERING AND PUMPING

Exchange rate: 1€= 2,700UGSh

ITEM	QUANTITY	UNITS	RATE (UGsh)	AMOUNT (UGsh)	AMOUNT (Euro)
Guttering					
5" Aluminium gutters	72	meters	34,800	2,505,600	928.00
3"PVC pipes	30	meters	20,250	607,500	225.00
Barbed wire roll	2	–	23,200	46,400	17.20
3"PVC elbow	4	piece	3,700	14,800	5.50
3"PVC T piece	2	piece	3,700	14,800	5.50
Sealing polish	2	box	14,500	29,000	10.70
Gutter bracket	90	piece	2,200	198,000	79.30
Screw	4	Kg	5,300	21,200	7.90
Pumping					
Treadle pump	1	–	330,000	330,000	122.20
Hose line	66	meters	3,500	231,000	85.60
Gasket	5	piece	15,000	75,000	27.80
Transport					
Gutters and pipes transport	1	trip	186,000	186,000	68.90
Pump and hose line transport	1	trip	140,000	140,000	51.85
SUB-TOTAL				4,399,300	1,629.40
Unexpected costs					
Unexpected cost	3.5%	–		154,032.5	57.00
TOTAL				**4,553,332.50**	**1,686.40**

SEEDS AND TOOLS

Exchange rate: 1€= 2,700UGSh

ITEM	QUANTITY	UNITS	RATE (UGsh)	AMOUNT (UGsh)	AMOUNT (Euro)
Seeds					
Beans	250	Kg	3,000	750,000	277.80
Sweet potato	150	Kg	4,800	720,000	266.70
Maize	30	Kg	2,500	75,000	27.80
Millet	20	Kg	1,800	36,000	13.30
Rice	80	Kg	3,500	280,000	103.70
Sorghum	20	Kg	1,800	36,000	27.80
Eggplant	1	Kg	10,200	10,200	3.80
Green pepper	1	Kg	6,500	6,500	2.40
Carrot	1	Kg	5,700	5,700	2.10
Cabbage	1	Kg	8,900	8,900	3.30
Tools					
Hoe	40	–	14,200	568,000	210.40
Panga (machete)	20	–	8,200	164,000	60.70
Wheel barrow	5	–	47,000	235,000	87.00
SUB-TOTAL				2,895,300	1,072.30
TOTAL				**2,895,300**	**1,072.30**

AGRICULTURAL TRAINING CENTER

Exchange rate: 1€= 2,700UGSh

ITEM	QUANTITY	WAGE (UGSh/month)	WAGE NUMBER	AMOUNT (UGsh)	AMOUNT (Euro)
Personal					
Program coordinator	1	250,000	12	3,000,000	1,111.10
Teacher	4	200,000	12	9,600,000	3,555.60
Interpreter	2	150,000	12	3,600,000	1,333.30
SUB-TOTAL				16,200,000	6,000.
Unexpected costs					
Inflation	4%	–		648,000	240.00
TOTAL				**16,848,000**	**6,240**

AGRÓNOMOS

ETSIAUPM